

ASPARAGUS

F. M. HEXAMER

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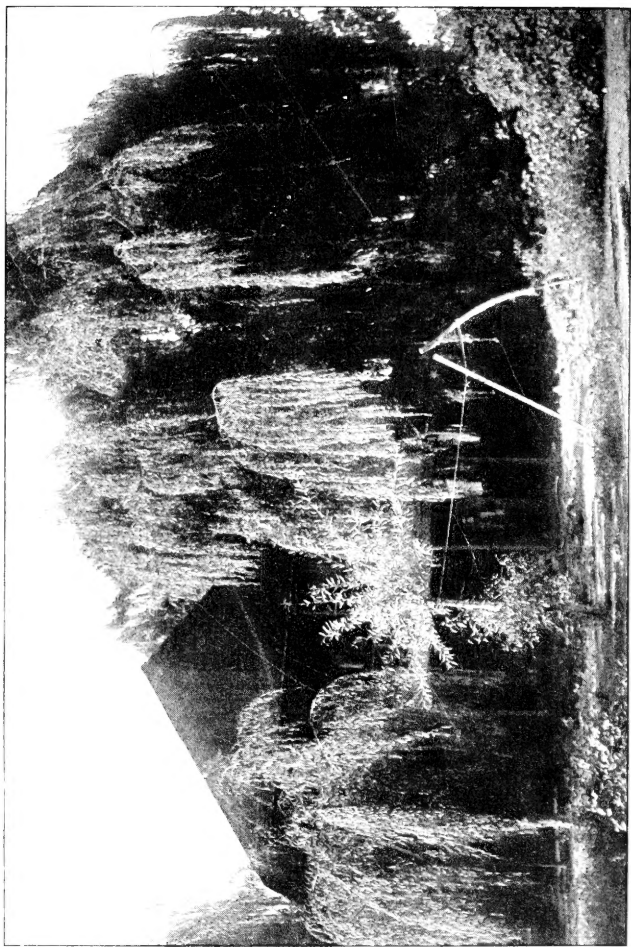


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BEGINNING OF THE ASPARAGUS INDUSTRY IN CALIFORNIA

ASPARAGUS

ITS CULTURE FOR HOME
USE AND FOR MARKET

A PRACTICAL TREATISE ON THE
PLANTING, CULTIVATION, HAR-
VESTING, MARKETING, AND PRE-
SERVING OF ASPARAGUS, WITH
NOTES ON ITS HISTORY AND
BOTANY : : : : : : :

BY

F. M. HEXAMER

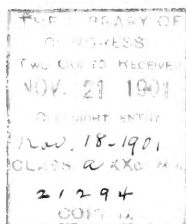
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PREFACE



THE cultivation of asparagus for home use as well as for market is so rapidly increasing, and reliable information pertaining to it is so frequently asked for, that a book on this subject is evidently needed. While all works on vegetable culture treat more or less extensively on its cultivation, so far there has been no book exclusively devoted to asparagus published in America. Asparagus is one of the earliest, most delicious, and surest products of the garden. Its position among other vegetables is unique, and when once planted it lasts a lifetime; it may be prepared for use in great variety, and may be canned or dried so as to be available at any time of the year; and yet in the great majority of farm gardens it is almost unknown. The principal reason for this neglect is based upon the erroneous idea that asparagus culture requires unusual skill, expense, and hard work. While this was true, in a measure, under old-time rules, modern methods have so simplified every detail connected with the cultivation of asparagus as to make it not necessarily more expensive and laborious than that of any other garden crop. To de-

scribe and make clear these improved methods, to demonstrate how easily and inexpensively an asparagus bed may be had in every garden, and how much pleasure, health, and profit may be derived from the crop have been the principal inducements to writing this book.

In a popular treatise on so widely distributed a vegetable as asparagus, the cultivation of which had been brought to a high state of development many centuries before the Christian era, there is little opportunity for originality. All that the author has endeavored in this little volume has been to collect, arrange, classify, and systematize all obtainable facts, compare them with his own many years' experience in asparagus culture, and present his inferences in a plain and popular manner. Free use has been made of all available literature, especially helpful among which has been the Farmers' Bulletin No. 61 of the United States Department of Agriculture, by R. B. Handy ; also bulletins of the Missouri, New York, Ohio, New Jersey, North Carolina, Maryland, Massachusetts, and South Carolina and other experiment stations; the files of *American Agriculturist* ; *Gardener's Chronicle*, from which descriptions of several ornamental species by William Watson were condensed; Thome's "Flora von Deutschland;" "Eintraegliche Spargelzucht," von Franz Goeschke; "Braunschweiger Spargelbuch,"

von Dr. Ed. Brinckmeier; "Parks and Gardens of Paris," by William Robinson; "Asparagus Culture," by James Barnes and William Robinson; "Les Plantes Potageres," by Vilmorin-Andrieux; the works of Peter Henderson, Thomas Bridgeman, J. C. Loudon, and others.

The author desires to express his grateful acknowledgments to Mr. Herbert Myrick, editor-in-chief of *American Agriculturist* and allied publications, for critically reading the whole manuscript; to Prof. W. G. Johnson, Charles V. Mapes, C. L. Allen, A. D. McNair, Superintendent Southern Pines Experimental Farm; Prof. W. F. Massey, Robert W. Nix, Robert Hickmott, Charles W. Prescott, Joel Borton, and all others who by their help, suggestions, and advice have aided him in the preparation of this work.

F. M. HEXAMER.

New York, 1901.

ASPARAGUS

I

HISTORICAL SKETCH

HE word "asparagus" is said to be of Persian origin. In middle Latin it appears as *sparagus*; Italian, *sparajio*; old French, *esperaje*; old English, *sperage*, *sparage*, *sperach*. The middle Latin form, *sparagus*, was in English changed into *sparagrass*, *sparrow-grass*, and sometimes simply *grass*, terms which were until recently in good literary use. In modern French it is *asperge*; German, *spargel*; Dutch, *aspergie*; Spanish, *esperrago*.

The original habitat of the edible asparagus is not positively known, as it is now found naturalized throughout Europe, as well as in nearly all parts of the civilized world. How long the plant was used as a vegetable or as a medicine is likewise uncertain, but that it was known and highly prized by the Romans at least two centuries before the Christian era is historically recorded. According to Pliny, the Romans were already aware of the difference in quality, that grown near Ravenna being considered best, and was so large that three spears weighed one pound. The elder Cato has treated the subject with still greater care. He advises the sowing of the seed of asparagus in the beds of vine-dressers' reeds, which are culti-

vated in Italy for the support of the vines, and that they should be burned in the spring of the third year, as the ashes would act as a manure to the future crop. He also recommends that the plants be renewed after eight or nine years.

The usual method of preparing asparagus pursued by the Roman cooks was to select the finest sprouts and to dry them. When wanted for the table they were put in hot water and cooked a few minutes. To this practice is owing one of Emperor Augustus's favorite sayings: "*Citius quam asparagi coquentur*" (Do it quicker than you can cook asparagus).

While the indigenous asparagus has been used from time immemorial as a medicine by Gauls, Germans, and Britons, its cultivation and use as a vegetable was only made known to the people by the invading Roman armies. But in the early part of the sixteenth century it was mentioned among the cultivated garden vegetables, and Leonard Meager, in his "English Gardener," published in 1683, informs us that in his time the London market was well supplied with "forced" asparagus.

The medicinal virtues formerly attributed to asparagus comprise a wide range. The roots, sprouts, and seeds were used as medicine. The fresh roots are diuretic, perhaps owing to the immediate crystalizable principle, "asparagine," which is said to be sedative in the dose of a few grains. A syrup made of the young shoots and an extract of the roots has been recommended as a sedative in heart affections, and the *species diuretica*—a mixture of asparagus, celery, parsley, holly, and sweet fennel—was a favorite preparation

for use in dropsy and gravel. Among the Greeks and Romans it was one of the oldest and most valued medicines, and to which most absurd virtues were attributed. It was believed that if a person anointed himself with a liniment made of asparagus and oil the bees would not approach or sting him. It was also believed that if the root be put on a tooth which aches violently it causes it to come out without pain. The therapeutic virtues of asparagus seem to have been held in almost as high esteem by the ancients as those of ginseng are esteemed by the Chinese to this day

II

BOTANY



THE genus *Asparagus* belongs to the Lily Family. It comprises about one hundred and fifty species, and these are spread through the temperate and tropical regions of the Old World. One-half of these species are indigenous to South Africa, and it is from this region that the most ornamental of the greenhouse species have been obtained.

All the species are perennial, with generally fleshy roots or tubers. The stems are annual in some, perennial in others, most of them being spiny, climbing shrubs, growing to a length of from five to twenty or even fifty feet. The true leaves are usually changed into spines, which are situated at the base of the branches and are often stout and woody. The false leaves, termed cladodia, are the linear or hair-like organs which are popularly called leaves; they are in reality modified branches. These cladodia are nearly always arranged in clusters at intervals along the branches, and the flowers generally spring from their axils. They usually fall off the hardy species in winter, and they are easily affected by unfavorable conditions in all the species. Most of them flower and fruit freely under cultivation, so that seeds are available for propagation.



FIG. 2—*ASPARAGUS PLUMOSUS NANUS*

ORNAMENTAL SPECIES

A. medeoloides (*Myrsiphyllum asparagoides*), popularly known as Smilax.—For many years this has been, and is yet, one of the most commonly grown and the most serviceable of the plants used by florists as “green.” It is readily grown from seed in the greenhouse. While a few other species of asparagus have been close rivals, it is yet unexcelled for many purposes of floral decorations.

A. plumosus (the plummy asparagus).—A very graceful climbing plant which for finer decoration has largely taken the place of smilax, its foliage being finer than that of the most delicate ferns, and will last for weeks after being cut. The whole plant is of a bright, cheerful green. Its branches spread horizontally, and branch again in such a manner as to form a flat, frond-like arrangement, the leaves being very numerous, in clusters of about a dozen, bright green, and one-half inch long. A native of South Africa, where it climbs over bushes and branches in moist situations. There are several named varieties of this, most of which have originated in gardens. The most distinct are *A. tenuissimus* and *A. plumosus nanus*, the fern-like appearance of which is seen in Fig. 2.

A. Sprengeri.—This is one of the best and most attractive house plants of recent introduction. It is of graceful form and habit when grown as a pot plant, but it is equally well suited for planting in hanging baskets. Its fronds are frequently four feet long, of a rich shade of green, and very useful for cutting, retaining their freshness for weeks after being cut. As a



FIG. 3—*ASPARAGUS SPRENGERI*

house plant it has exceeded expectations, as it stands dry atmosphere better than the older kinds of ornamental asparagus, and is not particular as to any special position. It delights in a well-enriched soil, rather light in composition, with plenty of drainage, and grows very rapidly. It is decidedly pretty when in bloom, its little flowers being pure white on short racemes, and the anthers are of a bright orange color. Fig. 3 gives a good idea of its graceful habit.

A. falcatus.—One of the most striking twining plants for a large, temperate house. At the Kew Gardens, in London, England, is an enormous specimen of this species which is trained against the northern staircase, where it has formed a perfect thicket two yards through and twenty-five feet high, of long, rope-like, intertwining, spinous, fawn-colored stems, some of them fully fifty feet long, and clothed with wiry, woody branches, bearing whorls of leaves from two to three inches long and nearly one-fourth of an inch wide, falcate and bright green. The young stems are thick and succulent and gray-green, mottled with brown. For large conservatories, and particularly in moist, shady corners, where ordinary climbers will not thrive, this is an ideal plant. It is a native of the tropics of Asia and Africa, as well as the Cape.

A. laricinus (Fig. 4).—This handsome species has been in the Kew collection at least twenty years. It is grown in the succulent house, where, from a vigorous root system, it sends up annual stout succulent shoots, which grow to a length of about twelve feet, and when fully developed are decidedly orna-

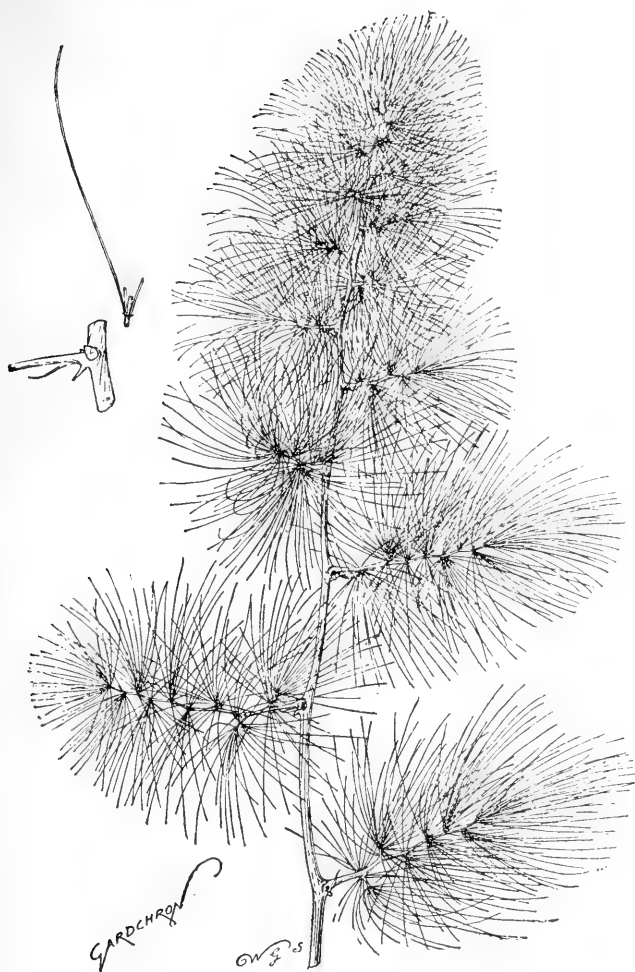


FIG. 4—*ASPARAGUS LARICINUS*

mental. The stems are perennial, terete, dark brown, woody, one-half inch in diameter at the base, very spinous, freely branched, and branches zigzag and gray, the leaves in clusters one-fourth inch apart, hair-like, one and one-half inches long, bright green, persistent. Flowers axillary, many in a cluster, small, campanulate, white. Berries globose, dull red, one seeded, one-sixth of an inch in diameter. Common in various parts of South Africa. It is an excellent pillar plant.

A. racemosus.—This species is spread throughout the tropics of Africa and Asia; the Cape form of it is represented at Kew under the name of variety *tetragonus*, as shown in Fig. 5. This is a vigorous grower, with woody stems nine feet long, prickly at the base, fawn colored, freely branching above, each branch having at its base a sharp spine three-quarters of an inch long. The leaves are of a gray-green hue, four-angled, one-quarter of an inch long. Flowers in racemes two inches long, whitish, very fragrant. Berry red, globose, pulpy, one-seeded. An excellent climber for rafters, pillars, etc., growing vigorously under ordinary treatment. Its root system is a dense mass of tubers.

A. sarmentosus (Fig. 6).—An elegant evergreen species from South Africa, where it grows freely in moist situations, forming dense, brushy stems with short prickles, and studded with white, starry, fragrant flowers, which are followed with bright scarlet, pea-like berries; has stems four feet high, freely branched and clothed with dark green flat leaves three inches long.



FIG. 5—*ASPARAGUS RACEMOSUS*, VAR. *TETRAGONUS*

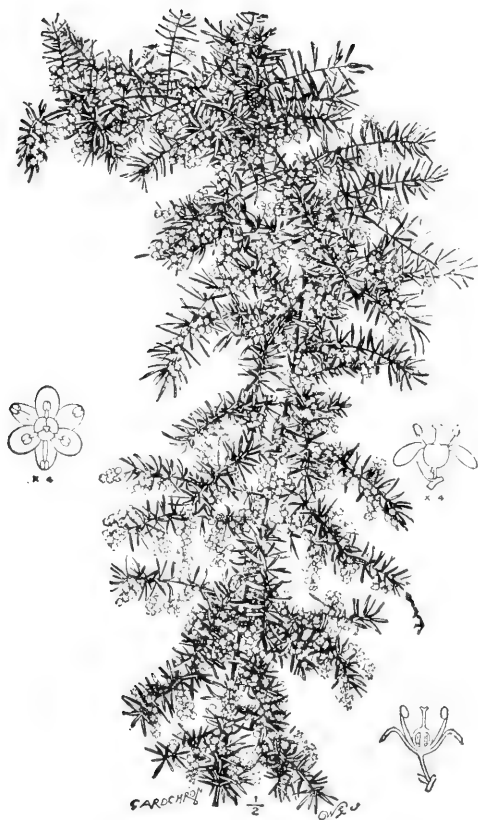


FIG. 6—*ASPARAGUS SARMENTOSUS*

It is also grown in pots and baskets for the Cape-house, and when in flower it is greatly admired.

A. Broussoneti.—A beautiful hardy perennial climber from the Canary Islands, growing ten feet high; feathery foliage and scarlet berries. In the autumn this is very ornamental.

Among the most noteworthy of other ornamental species are: *A. Aethiopicus*, *Africanus*, *Asiaticus*, *Cooperi*, *crispus*, *declinatus*, *decumbens*, *lucidus*, *retrofractus*, *scandens*, *tenuifolius*, *trichophyllus*, *umbellatus*, *verticillatus*, *virgatus*, etc., etc.

EDIBLE SPECIES

Asparagus officinalis.—While the young sprouts of a few other species may be used as food, this is the only one which has found a permanent place in cultivation. It is a branching, herbaceous plant, reaching a height of from three to seven feet; the filiform branchlets, three to seven inches long, less than one-quarter inch thick, are mostly clustered in the axils of minute scales. The rootstock, or "crown," is perennial, and makes a new growth each year of from one to three inches, extending horizontally, and generally in a straight line. It may propagate from both ends, or from only one, but in either case the older part of root stalk becomes unproductive and finally dies. Fig. 7 shows the new portion of the rootstock crowned with buds for the production of new shoots, while the older portion bears the scars and dead scales of previous growths. From the sides and the lower part of the rootstock numerous cylindrical, fleshy roots start

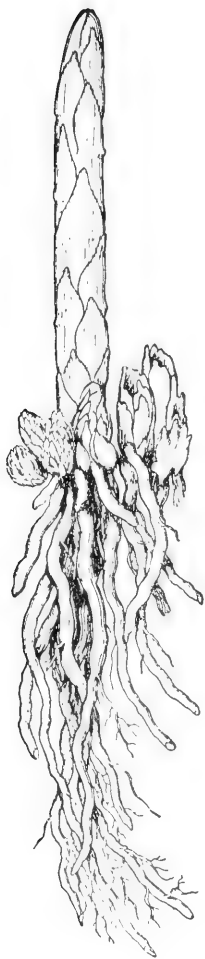


FIG. 7—ASPARAGUS CROWN,
ROOTS, BUDS, AND
SPEAR

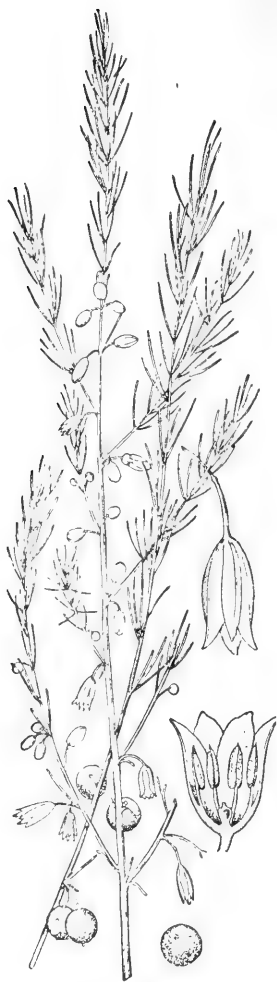


FIG. 8—ASPARAGUS STEM,
LEAVES, FLOWERS,
AND BERRIES

and extend several feet horizontally, but do not penetrate the soil deeply. In the course of time the older roots become hollow and inactive without becoming detached from the rootstock. The young root formation always takes place a little above the old roots, which circumstance explains why the asparagus plants gradually rise above the original level, thus necessitating the annual hilling up or the covering of the crowns with additional soil.

The asparagus flowers are mostly solitary at the



FIG. 9



FIG. 10



FIG. 11

nodes, of greenish-yellow color, drooping or filiform, jointed peduncles; perianth, six-parted, campanulate, as seen in Fig. 8. Anthers, introrse; style, short; stigma, three-lobed; berry, red, spherical, three-celled; cells, two-seeded. While the flowers are generally dioecious—staminate and pistillate flowers being borne on different plants—there appear also hermaphrodite flowers, having both pistils and fully developed stamens in the same flower. Fig. 9 shows a pistillate, Fig. 10 a staminate, and Fig. 11 a hermaphrodite or bisexual flower.

In one case, at least, the author has also observed that a plant which has been barren of seed at first changed into a seed-bearing plant the following year. Similar changes in the sexuality of strawberries have been observed under certain conditions. These facts may explain, in a measure, the difficulty experienced in raising permanently sterile asparagus plants.

Asparagus acutifolius.—A native of Southern Europe and Northern Africa. It has a fleshy root-stock, hard, wiry, brown stems, five to seven feet high, with rigid branches three to six inches long, thickly closed, with tufts of gray-green, hair-like, rigid leaves, which in exposed situations are almost spinous. Flowers yellow, a quarter of an inch in diameter, fragrant. The young sprouts are tender, and, when cooked, of a peculiar aromatic flavor. In their native home they are used like the cultivated kind.

A. aphyllus.—Indigenous to Greece, where the young shoots are commonly used as food, especially during Lent.

III

CULTURAL VARIETIES



ALTHOUGH but one species of edible asparagus has found its way into general cultivation, many varieties and strains are recognized.

Up to within a comparatively recent period it was thought that there existed only one distinct kind, or variety, of asparagus. As late as 1869 so keen an observer as Peter Henderson believed that "the asparagus of our gardens is confined to only one variety, and the so-called giant can be made gigantic or otherwise, just as we will it, and the purple top variety will become a green top whenever the composition of the soil is not of the kind to develop the purple, and *vice versa*. All practical gardeners know how different soils and climates change the appearance of the same variety. Seeds of cabbage taken from the same bag and sown at the same time, but planted out in soils of light sandy loam, heavy clayey loam, and peat or leaf-mold, will show such marked differences when at maturity as easily to be pronounced different sorts. This, no doubt, is the reason why the multitude of varieties of all vegetables, when planted side by side to test them, are so wonderfully reduced in number."

But after inspecting an acre of ordinary asparagus and an acre of Abraham Van Siclen's Colossal—which was afterward introduced as Conover's Colossal—at

Jamaica, L. I., N. Y., Mr. Henderson wrote: "A thorough inspection of the roots of each lot proved that they were of the same age when planted. The soil was next examined, and found to be as near the same as could be, yet these two beds of asparagus showed a difference that no longer left me a shadow of a doubt of their being entirely different varieties."

In but few vegetables do the conditions of soil, locality, mode of cultivation, and other circumstances affect the quality, size, and appearance as much as in asparagus. It is therefore difficult to distinguish fixed and permanent varieties from mere local strains and forms secured by selection.

Through natural and artificial selection, through use of seed of strong shoots from superior roots, there has been improvement in the size and yield of asparagus; from the peculiar adaptability of soil and climate, and the effect of manure and high cultivation, there have appeared certain variations in the product of different beds which have led to the bestowing of a new name; but the effect of this care and these favorable conditions is not sufficiently strong to produce distinct varieties with fixed characteristics. Therefore, with correct and rational treatment of the plant from the time of seeding through all the stages of culture, satisfactory results may be reached with almost any of the varieties on the market.

AMERICAN VARIETIES

Barr's Mammoth (Barr's Philadelphia Mammoth). —Originated with Crawford Barr, a prominent market gardener of Pennsylvania. It is one of the earliest

varieties, is very productive, and grows to the largest size. In Philadelphia it is much sought after, and brings the highest prices.

Conover's Colossal (Van Siclen's Colossal).—Originated with Abraham Van Siclen, of Long Island, N. Y., and was introduced by S. B. Conover, a commission merchant of West Washington Market, New York City, some thirty years ago. The superiority of this variety over all other kinds known at that time made it soon supplant all other varieties, and it is to this day better and more favorably known than any other sort.

Columbian Mammoth White.—This was introduced by D. M. Ferry & Co., in 1893. The immense shoots are clear white, and, in favorable weather, remain so until three or four inches above the surface, without earthing up or any other artificial blanching. The crown or bud of the young stalk is considerably smaller than the part just below it, thus further distinguishing the variety. All but a very few of the seedlings will produce clear white shoots, and the green ones can be readily distinguished and rejected when planting the permanent bed.

Donald's Elmira.—Originated by A. Donald, Elmira, N. Y., and was first introduced by Johnson & Stokes, Philadelphia, Pa. This is characterized by the delicate green color of its stems, different from any other kind. Its stalks are very tender and succulent, while its size is all that can be desired.

Eclipse (Dreer's Eclipse).—A light green mammoth strain of excellent quality and attractive appearance. The stalks, not rarely, measure two inches in diameter,

and even when twelve to fifteen inches long are perfectly tender and of a delicate light green color.

Hub.—Originated in New Hampshire several years ago, and was introduced by Joseph Breck & Sons, Boston, Mass. Although not generally catalogued, it is a distinct and valuable variety that has made a decided record for itself in the tests of the Kansas Experiment Station, where its yield, by weight, was greater than any other.

Mammoth.—This is a somewhat indefinite term, as almost any prominent seedsman and grower who has a particularly good and large strain of asparagus suffixes it to his own name. Among the best known of these are Vick's Mammoth, Maule's Mammoth, Prescott's Mammoth, etc.

Moore's Cross-bred.—This originated with J. B. Moore, who for twenty years was awarded the first prize on asparagus at the exhibitions of the Massachusetts Horticultural Society, at one of which the weight of twelve stalks was 4 pounds 6¼ ounces. It retains the head close until the stalks are quite long, and is of uniform color, while for tenderness and eating quality it is excelled by none. It is particularly recommended for cultivation in New England.

Palmetto.—A variety of Southern origin, but suitable for the North also. At the South it is somewhat earlier than Conover's Colossal, but its great advantage is that it is almost destitute of, what dealers call, culls, nearly all shoots being of a uniform and large size. The bunch from which the engraving (Fig. 12) was made measured twenty-two inches in circumference,

and contained forty-eight stalks of nine inches in length and remarkably uniform in size. It was taken on March 30th from a field of fifty acres, near Charleston, S. C. But the greatest point in its favor is its comparative security from the attacks of rust.

Purple Top and *Green Top*.—These were the only

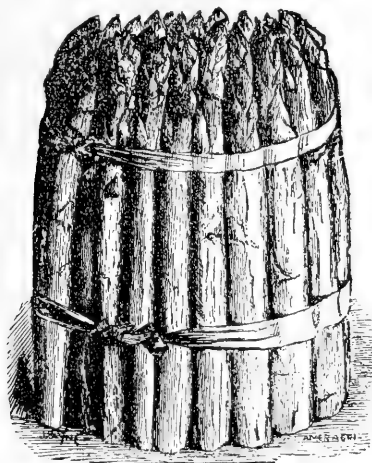


FIG. 12—BUNCH OF PALMETTO ASPARAGUS

distinct sorts in cultivation before the introduction of Conover's Colossal, but are now almost unknown to the trade and cultivators.

EUROPEAN VARIETIES

The named varieties of asparagus of European origin are very numerous, as almost every locality in which asparagus is cultivated extensively and successfully has given its name to a strain more or less dis-

tinct. Generally these varieties differ only in a single characteristic, and these differences, for the most part, are so little that they are lost when grown under different climatic and soil conditions. The best-informed authorities recognize three cultivated varieties, which have distinct commercial characteristics and whose seeds reproduce them in the seedlings.

German Giant.—This variety embraces most of the German and French sorts—the Giant Dutch Purple, Ulm Giant, Giant Brunswick, Large Erfurt, Early Darmstadt, and many others.

Argenteuil.—Of this three sub-varieties are recognized—the early, intermediate, and late; and these are the kinds grown almost exclusively in the vicinity of Paris, France, where its culture and improvement have steadily developed for centuries. Under good culture the late Argenteuil produces stalks from three to six inches in circumference, at eight inches below the tips.

Yellow Burgundy.—The distinctive characteristic of this variety is that the young shoots below the surface of the soil are light yellow instead of white to tips, being greenish-yellow. It is also claimed to be more rust-resisting than other European sorts.

VARIETY TESTS

To determine the comparative effects of manuring on different varieties of asparagus, and also their comparative earliness, Prof. S. C. Mason and his assistant, W. L. Hall, of the Kansas Experiment Station, have made some interesting and instructive experiments,

the results of which are given in Bulletin 70, as follows:

“ The seed of ten varieties of asparagus was planted. A good stand was secured, and the young plants were cultivated during the summer in the usual way. Early the following spring the entire patch was dug up and the roots heeled in. The same ground was then prepared for a permanent plantation, by plowing it deeply and marking it with furrows four feet apart. These furrows were made as deep as possible, but after the loose soil had run back into them they were on the bottom hardly six inches below the level of the ground. In these furrows the roots of the seedlings were planted (240 feet of row for each variety), making altogether a patch of 35.25 square rods, or a little more than one-fifth of an acre (.22 of an acre). The plants were set about a foot apart in the row, and covered only an inch or two above the crown, leaving along the rows depressions some two inches deep, which were gradually filled up during the summer, by the many cultivations. During the winter the stalks were cleared off, but nothing was done with the patch in the spring more than to cut and note the earliest shoots, the first cutting of which was made April 13th. The patch was cultivated during summer as before, except that the size of the plants interfered somewhat—many of the plants growing six feet high and correspondingly broad. During the fall the north half of each variety was manured, at the rate of fifty loads per acre, with strong barn-yard manure, and in the spring the effect was noted.

“ The following table gives results as shown by the

records of ten cuttings made the spring of 1897, from April 20th to May 19th, inclusive; varieties averaged in order of yield :

VARIETIES		YIELDS IN POUNDS		
240 feet of row in each, one-half manured and one-half unmanured				
		<i>Manured</i>	<i>Unmanured</i>	<i>Total</i>
1	Hub	31	27	58
2	Donald's Elmira	29	29	58
3	Vick's New Mammoth	26	20	47
4	Palmetto	20	18	39
5	Moore's Cross-bred	19	15	35
6	Conover's Colossal	16	17	33
7	Barr's Philadelphia Mammoth.	17	16	33
8	Columbian Mammoth White	18	13	32
9	Dreer's Eclipse	16	11	30
10	Giant Purple Top	15	11	29
Totals		207	183	394

“Of the two heaviest yielding varieties, Hub and Donald's Elmira, the last named is the earliest, though Hub is also quite early. As nearly as can be judged from the notes, the ten varieties rank for earliness about as follows, though all kinds yielded something at the first cutting :

- | | | |
|---|----|------------------------------|
| { | 10 | Giant Purple Top. |
| | 7 | Barr's Philadelphia Mammoth. |
| | 2 | Donald's Elmira. |
| { | 6 | Conover's Colossal. |
| | 3 | Vick's New Mammoth. |
| { | 1 | The Hub. |
| | 9 | Dreer's Eclipse. |
| | 4 | Palmetto. |
| | 5 | Moore's Cross-bred. |
| | 8 | Columbian Mammoth White. |

“Those included within a brace have little or no difference of season. The numbers mark their rank

with regard to yield, 1 being the highest. The ground occupied by this plantation is a rather low bottom-land, being built up of a clay silt from the former overflow of two creeks, mixed with vegetable mold. It is rather too compact for the best growth of asparagus, as it contains very little sand."

IV

SEED GROWING



THE asparagus plant begins to produce seed when two years old. When fully developed the stalks are from five to six feet in height, with numerous branches upon which are produced a profusion of bright scarlet berries, containing from three to six seeds each. It is not advisable, however, to harvest seed from plants less than four years old.

To save the seed the stalks are cut close to the ground as soon as the berries are ripe, which may be known by their changing color, from green to scarlet, and softening somewhat. The entire stalks are then cut off, tied in bundles, and hung up in a dry place safe from the attacks of birds, some kinds of which are very fond of this seed. After the berries are fully dried they are stripped off by hand, or thrashed upon a cloth or floor, and separated from the chaff. They are then soaked in water for a day or two to soften the skin and pulp of the berries, after which they are rubbed between the hands, or mashed with a wooden pounder, to break the outer shells. The separation of the pulp from the seed is accomplished by washing. When placed in water the seeds will settle with the pulp and the shells will readily pass away in pouring off the water. To clean the seeds thoroughly the

washing has to be repeated three or four times. It is then spread on boards or trays to dry in the sun and wind. After the first day it should be removed from the sun, but exposed to the air in a dry loft, spread thin for ten days or more. When thoroughly dried the seed is stored in linen or paper bags until needed.

When cheapness of the seed is the main consideration such promiscuous harvesting may be permissible, but when only the best is desired careful selection and preparation becomes necessary. Even if the parent plants are of choice types, not all the seeds from them are equally good. The seed, for instance, which has been gathered from a stool which has flowered side by side with an inferior kind, and at the same time, may be worthless, because it has been fertilized badly. Then the last heads generally yield nothing but doubtful seed which seldom reproduces the proper type. The seeds which grow at the end of the shoots also, as well as those produced by the upper and lower extremities of the stem, have the same defect.

In order to insure the production of the very best asparagus seed a sufficient number of pistillate or seed-bearing plants, which produce the strongest and best spears, should be selected and marked so that they may be distinguished the following spring when the shoots appear. These clumps should be close together and near some staminate or male plants which have to be marked likewise, as without their presence fertile seed can not be produced. The number of the male to the female plants should be about one to four or five. The following spring all the sprouts of the selected male

plants are allowed to grow without cutting any. On each hill of the female plants the two strongest and earliest stalks are allowed to grow, cutting the later appearing spears with the others for market or home use. Thus these early stalks of both male and female plants bloom together before any other stalks, and the blooms on the female plants will be fertilized with the pollen of the selected male plants. This last is of prime importance, for on proper fertilization depends the purity of the seed as well as the vigor of the resultant plant. Not all seed of even a good plant properly fertilized should be used for reproduction, as of the seeds gathered from any plant some will be better than others. Only the largest, plumpest, and best matured seeds should be used, for by saving these the most nearly typical plants of the sort will be most certainly produced. The selection of the best seed from typical plants is as essential to success as are good soil, thorough cultivation, and heavy manuring.

The best seeds are produced from the lower part of the stalk, hence it is well to top the plant after the seed is well set, taking off about ten inches, and to remove the berries from the upper branches, that all the strength may go to the full development of the more desirable berries. If, after this has been done, there is more than sufficient seed for the purpose desired, a second discrimination can be made between the seed of plants which produce numerous berries and those which are shy bearers, the latter being desirable, as this indicates a tendency in the plant to produce stalk rather than seed, and it is as a stalk producer that asparagus is valuable.

Harvesting, cleaning, and preserving the seed is, of course, to be done carefully; the separation of the heavy and the light seeds can be accomplished by means of water, while the larger can be selected from the resultant mass by the use of a properly meshed sieve.

V

THE RAISING OF PLANTS



SPARAGUS can be propagated by division of the roots, but this method gives so unsatisfactory results that it is rarely practiced.

Raising the plants from seed is therefore the only method worth considering. The seed may be sown either in the fall or spring. But far more important than the time for sowing is the quality of the seed. While asparagus seed retains its vitality for two or more years, it is not safe to use seed older than one year. Fresh seed may be recognized by its glossy black color and uniform smooth surface, while old seed has a smutty gray color and its surface is generally rough and wrinkled. Yet even with this as a guide it is not easy to distinguish bad from good seed, and still more difficult, if not impossible, is it to distinguish the seed of different varieties. It is therefore advisable to procure seed only from dealers of undoubted reliability and pay a fair price for it rather than to accept poor seed as a gift. A uniformity of the individual plants in the asparagus bed or field is a matter of prime importance; only large, fully developed seeds should be used, screening out and rejecting all small and inferior ones.

In northern latitudes spring sowing is preferable to fall sowing. The ground of the seed-bed should be well drained and fairly retentive of moisture. As

soon as the soil admits of working it should be well pulverized and enriched with decomposed manure. On a small scale a spading-fork is the best implement for preparing soil for nursery rows of asparagus plants.

Straight lines should be marked about fifteen inches apart and drills made about an inch deep when the sowing is done very early in the season, and one-half to one inch deeper when the sowing is done later. In these drills the seed should be dropped two or three inches apart. The covering may be made with a hoe, after which the soil should be well pressed down with the foot. As the seed is slow to germinate—in from four to six weeks, according to weather conditions—it is well to sow with it a few radish seeds, which will soon appear and mark the lines of the drills, so that cultivation may begin at once. Soaking the seed in luke-warm water for twenty-four hours before sowing will hasten its germination.

The cultivation of the young plants consists in keeping the soil about them light, and free from grass and weeds. Most of this work can be done with a garden cultivator, or a hoe and rake or prong hoe, but some hand weeding is generally necessary in addition. Strict attention to this will save a year in time, for if the seed-bed has been neglected, it will take two years to get the plants as large as they should be in one year if they had been properly cared for. In consequence of this very frequent neglect of proper cultivation of the seed-bed, it is a common impression that the plants must be two years old before transplanting. One pound of seed will produce about 10,000 plants, but as many of these will have to be thinned out and poor

ones rejected, it is not safe to count upon more than one-half of this number of good plants. The number of plants required for an acre varies according to the manner of planting. If planted in rows three feet apart and two feet in the rows, it will require 7,260 plants per acre ; if planted three by four, 3,630 per acre.

SOWING THE SEED WHERE THE PLANTS ARE TO REMAIN

Growing asparagus without transplanting is gradually finding many advocates among those who raise only the green article. It is not only a cheaper but in some respects a better method than the raising of the plants in a special seed-bed, from which they are transplanted after a year or two. "The plan is very simple," wrote Peter Henderson in *American Agriculturist*, "and can be followed by any one having even a slight knowledge of farming or gardening work. In the fall prepare the land by manuring, deep plowing, and harrowing, making it as level and smooth as possible for the reception of the seed. Strike out lines three feet apart and about two to three inches deep, in which sow the seed by hand or seed-drill, as is most convenient, using from five to seven pounds of seed to each acre. After sowing, and before covering, tread down the seed in the rows with the feet evenly ; then draw the back of the rake lengthwise over the rows, after which roll the whole surface.

"As soon as the land is dry and fit to work in the spring, the young plants of asparagus will start through the ground, sufficient to define the rows. At once begin to cultivate with hand or horse cultivator,

and stir the ground so as to destroy the embryo weeds, breaking the soil in the rows between the plants with the fingers or hand weeder for the same purpose. This must be repeated at intervals of two or three weeks during the summer, as the success of this plan is entirely dependent on keeping down the weeds, which, if allowed to grow, would soon smother the asparagus plants, that, for the first season of their growth, are weaker than most weeds. In two or three months after starting, the asparagus will have attained ten or twelve inches in height, and it must now be thinned out, so that the plants stand nine inches apart in the rows. By fall they will be from two to three feet in height and, if the directions for culture have been faithfully followed, strong and vigorous.

“When the stems die down (but not before) cut them off close to the ground, and cover the lines for five or six inches on each side with two or three inches of rough manure. The following spring renew cultivation, and keep down the weeds the second year exactly as was done during the first, and so on to the spring of the fourth year, when a crop will be produced that will well reward all the labor that has been expended. Sometimes, if the land is particularly suitable, a marketable crop may be secured the third year, but as a rule it will be better to wait until the fourth year before cutting much, as this would weaken the plants. To compensate for the loss of a year's time in thus growing asparagus from seed, cabbage, lettuce, onions, beets, spinach or similar crops that will be marketable before the asparagus has grown high enough to interfere with them, may be planted be-

tween the rows of asparagus the first year of its growth with but little injury to it."

GOOD CROPS TWO YEARS FROM SEED

In answer to the many inquiries as to how asparagus can be grown to weigh two and three-fourths pounds per bunch of twenty-six stalks from plants two years old from seed, as exhibited at a recent American Institute spring exhibition, George M. Hay, of Connecticut, writes in *American Gardening* as follows:

"Select a piece of ground where the soil is light, but of a good depth, and plow thoroughly. About the 1st of May mark off the rows three or four feet apart—for myself I prefer the latter distance as giving plenty of room for cultivation. Run a two-horse plow over the same furrow two or three times and you will have a depth of from fourteen to eighteen inches.

"Trenches having been all made, we come to the most important part—namely, manuring. In order to give the young plants a good start after germination we have to use liberal quantities of well-rotted stable manure, and in this the young plants make roots that in a short time are surprising. I use a one-horse load of manure to every seventy-five feet of drill, tramping it well down, and with a rake draw from each side of the trench soil to cover the manure to a depth of from two to three inches. The surface is raked level, and with the end of a rake or hoe a furrow one inch deep is drawn.

"We are now ready for the seed, which should have been soaked in tepid water for at least twenty-four hours. This will insure the immediate starting

of the seed when the soil is moist and has not had a chance to dry out. If unsoaked seed is used and we have a dry spell for two or three weeks, the seed will be almost useless by the time it receives moisture enough to start.

“When the asparagus is two or three inches high thin out to one foot apart, being very careful not to disturb the plants left. A piece of a stick cut to the shape of a table-knife is an ideal tool for thinning out the young plants. It will be necessary to weed the rows by hand, while the plants are very small, for a distance of six inches on each side, as the cultivator, if run too close, will cover up the young plants. Keep the horse cultivator at work as often as possible to maintain moisture for the young roots.

“By fall you will be surprised to learn how far the young roots have traveled and the crowns prepared for next year’s crop. Cover the rows with stable manure for the winter, and in spring give a dressing of one pound of nitrate of soda to one hundred feet of drill, and you will be well repaid for the extra labor and outlay by being able to cut asparagus of extra size in two years from the time of sowing the seed, doing away with the transplanting of two-year-old roots, and then waiting two more years before the first crop can be cut.”

The principal objection which has been made against this system of not transplanting is that it does not admit of a careful choice of plants, as the plants must be kept in the places where sown, while in the transplanting method we need use only the choicest plants; then, if two or three seeds come up close together, it

is very difficult to thin them out, and if left they will produce an inferior growth.

POT-GROWN ASPARAGUS PLANTS

In the tests made at the Missouri Experiment Station, Prof. J. C. Whitten found that it is much better to plant the seeds in six inches of rich, sandy soil in the greenhouse or hotbed, in February or early March, than to wait two or three months for outdoor planting. Professor Whitten advises to "sow liberally, for seven-eighths of the seedlings should be discarded. When the seedlings are three inches high, select those which have the thickest, fleshiest, and most numerous stems, and pot them. They vary more than almost any other vegetable. Many that appear large and vigorous will have broad, flat, twisted, or corrugated stems. Discard them. Beware, also, of those that put out leaves close to the soil. These will all make tough, stringy, undesirable plants. The best plants are those which are cylindrical, smooth, and free from ridges. They shoot up rapidly, and attain a height of two inches before leaves are put out. They look much like smooth needles. This matter of selecting the best plants for potting, and subsequent planting out, is of the greatest importance in asparagus culture.

"These young plants should first be put in small pots and moved into larger ones as soon as they are well rooted. They may need to be shifted twice before they are planted out-of-doors, which should be done when danger of frost is over. Started in this way they continue to grow from the time they are planted out and reach very large size the first season. In the

case of nursery-grown plants, where seeds are sown directly out-of-doors, the young seedlings start very slowly, are very tender during their early growth, and

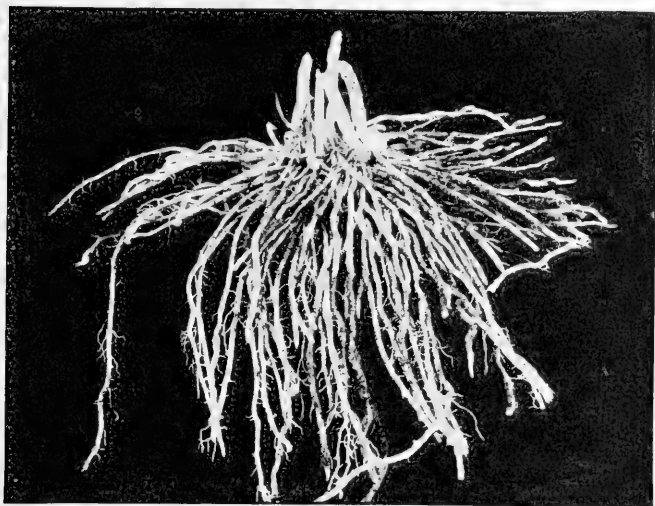


FIG. 13—ONE-YEAR-OLD POT-GROWN ASPARAGUS PLANT

if the weather is unfavorable they hardly become well established before autumn.”

Fig. 13 shows a one-year-old plant started in February in the greenhouse and transplanted to the field the first of May. Plants grown in this way reach as good size in one year as the nursery-grown plants usually do in three years.

VI

SELECTION OF PLANTS



THAT strong, healthy, one-year-old plants are in every way to be preferred to two or three year old ones has been demonstrated by many carefully conducted experiments, and is now universally recognized by intelligent and observant asparagus growers. The most noteworthy and accurate experiments in this line were made by the famous French asparagus specialist M. Godefroy-Lebœuf, who planted twelve stools of one, two, and three years old respectively in the same soil under the same conditions and at the same time. Calling those plantings Nos. 1, 2, and 3, the following are the results obtained:

First Year.—No. 1.—All the stools came up before May 4th, and were well grown.

No. 2.—Ten stools showed above ground before May 4th, one on the 10th, and one appeared to be dead. The asparagus heads were very fine—finer, indeed, than those of No. 1.

No. 3.—Eight stools showed above ground before May 4th, one on the 12th, and three gave no signs of life. The heads were very fine at first, but they became bent toward the end of the year (September 15th), and were much weaker than those of No. 2.

Second Year.—No. 1.—Well-grown, regular, and strong heads, which measured on September 15th one inch in circumference.

No. 2.—Well-grown but irregular heads, somewhat weaker than those of No. 1.

No. 3.—Only pretty well-grown heads, very irregular,

some of the stools having as many as eight or ten, but all very weak. One stool died after growing two heads.

Third Year.—No. 1.—Magnificent growths, the heads measuring on April 10th from two inches to three and one-quarter inches in circumference.

No. 2.—Growth passable only, but very irregular. Some of the stools were very small. The finest of them produced heads which from April 8th to 10th only measured two and one-half inches in circumference.

No. 3.—Growth very poor and very irregular. Some of the stools continued to produce small heads not much thicker than a quill pen, the largest being from one and one-half inch to two inches in circumference.

Fourth Year.—No. 1.—Growth very remarkable. The heads began to show on April 3d, 4th, 5th, 7th, and 10th. Some were from three and one-quarter inches to four inches in circumference, and measured four and three-quarter inches. Fifty of the heads formed a bundle which weighed seven pounds.

No. 2.—Growth passable, but later than No. 1. The heads made their first appearance on April 6th, 10th, and 11th. Many of them were very small; fifty of them barely made half a bundle, and only weighed three and three-quarter pounds.

No. 3.—Growth but poor, and somewhat late. The heads made their appearance on April 4th, 6th, 9th, and 11th; one did not show till the 22d. Fifty heads barely formed half a bundle and only weighed two and one-half pounds.

To sum up, it is clear that the plants of a year old in their fourth season—that is to say, after having been planted out for three years—gave a bundle weighing seven pounds, while those of two years old only gave three and three-quarter pounds, and those of three years old only two and one-half pounds; in other words, taking round numbers, the plantation made with the one-year-old plants produced double the crop of the two-year-old plants and treble that of the three-year-old plants. The reader may easily draw his conclusions from the preceding facts.

Equally important is a careful selection of the individual plants to be set out. A crown with four or five strong, well-developed buds is far better than one with a dozen or more of weak and sickly ones, as the latter will always produce thin and poor spears of poor quality. It is therefore highly to be recommended to select only plants with not over six buds and discard all others. The roots should be strong and of uniform thickness, succulent and not too fibrous. Dry or withered roots have to be cut off, and plants with many bruised or otherwise damaged roots should be rejected entirely. The best roots are the cheapest.

MALE AND FEMALE PLANTS

It has long been observed that all of the asparagus plants in a bed do not produce seeds, owing to the fact that the male and female flowers in asparagus are nearly always borne on separate plants. Seed bearing is an exhaustive process, and, as might be supposed, those plants that have produced seed have less vigor than those that have not. In order to determine the difference in vigor between the seed bearing and non-seed bearing plants, Prof. William J. Green, horticulturist of the Ohio Experiment Station, staked off fifty of each in a plantation of half an acre. When the cuttings were made the shoots taken from male and female plants were kept separate, and the weight of each recorded in Bulletin No. 9, Volume III., of the Ohio Station, as follows :

“The cuttings were made at regular intervals and in the ordinary manner, as for market purposes. The weight of shoots taken at each cutting is not given in

the table, since the facts are quite as well shown by stating the aggregate weight for periods of ten days each. The division into periods is made for the purpose of showing comparative earliness. This could be shown in a more marked degree by taking the first and second cuttings alone, but they were too limited in quantity to admit of conclusions being drawn from them; hence they are included with the other cuttings in the same period.

PRODUCT FROM FIFTY PLANTS EACH, MALE AND FEMALE

	<i>Product from fifty male plants</i>	<i>Product from fifty female plants</i>
	<i>Ounces</i>	<i>Ounces</i>
First period, 10 days	37	21
Second period, 10 days	104	68
Third period, 10 days	266	164
Fourth period, 10 days	203	154
Total for the season	610	407

“ This shows a gain of the male over the female plants of seventy-six per cent. for the first period, and a fraction less than fifty per cent. for the whole season. Reversing the standard of comparison, it will be seen that the female plants fall below the male forty-three per cent. for the first period, and a little more than thirty-three per cent. in the total. In no case did the female plants produce equally with the male.

“ If comparative earliness is determined by the date of first cutting alone, there is no difference between the male and female plants, since the first cutting was made on both at the same date; but taking quantity of product into consideration, which is the proper

method, there is a decided difference, the gain of the male over the female plants being seventy-six, fifty-two, sixty-three, and thirty-one per cent. for the four periods respectively. The difference in yield between the two was greatest at first, and diminished toward the last, which practically amounts to the same thing as the male being earlier than the female. There is a still further difference between the two in quality of product, the shoots of the female plant being smaller and inferior to those of the male.

“It is not safe to draw conclusions from such limited observations as these, further, at least, than to accept them as representing the truth approximately. Allowing a wide margin for possible error, there would still seem to be sufficient difference in productive capacity between the male and female plants to justify the selection of the former and rejection of the latter when a new plantation is to be started. If the figures given in the table are taken as a basis, the gain in the crop, if the male plants alone were used, would each season pay for all the plants rejected, and leave a handsome margin at the end of the term of years when an asparagus bed has served its period of usefulness. Male plants can be secured by division of old plants, or by selecting those that bear no seed, after they have attained the age of two years.”

In summing up the results of this experiment, Professor Green states that male asparagus plants are about fifty per cent. more productive than female plants, and the shoots being larger have a greater market value.

VII

THE SOIL AND ITS PREPARATION



ASPARAGUS in its wild state is usually found growing in light and sandy soils along or near the seashore, it has long been supposed that it could not be cultivated in other localities and soils. While it is true that asparagus succeeds best in a sandy, rich, and friable loam, naturally underdrained and yet not too dry, there is not another vegetable which accommodates itself more readily to as varying soils and conditions. There is hardly a State in the United States in which at present asparagus is not grown more or less extensively and profitably, and the most famous asparagus districts of France and Germany are situated at great distances from the seashore.

The question of what soil to use is, as a rule, already settled; we have to use the soil we have. Any good garden soil is suitable for asparagus, and if it is not in the most favorable condition, under existing circumstances, it can easily be made so. The soil should be free from roots, stones, or any material that will not readily disintegrate, or that will interfere with the growth of the spears, and with the knife in cutting. Fruit or other trees, or high shrubs, must not be allowed in the asparagus bed, because of the shade they throw over the beds, and because their roots make heavy drafts upon the soil. Nor should high trees, hedges, hills, or buildings be so near as to shade

the beds, because all the sunshine obtainable is needed to bring the spears quickly to the surface. Whenever practicable the asparagus bed should be protected from cold winds, and so slope that the full benefit of the sunshine will be obtained during the whole day. Brinckmeier, in his "Braunschweiger Spargelbuch," gives the following three rules for guidance in selecting a location for asparagus beds :

"1. One should choose, in reference to ground characteristics, open, free-lying land, protected to the north and east [which, for American conditions, should be north and west], of gradual slope, free from trees or shrubbery.

"2. The field should be exposed to the rays of the sun all day long; therefore, a southern exposure is desirable, or, if that is not obtainable, a southwesterly or southeasterly slope, because either east, west, or north exposure will cause shade during a greater or less portion of the day.

"3. Standing, stagnant ground water, which cannot be drawn off by drainage, is to be avoided, the requirements of the plants indicating a somewhat damp subsoil, but not too high ground water."

For commercial purposes on a large scale, and when the trucker has the choice of location, a well-drained, light, deep, sandy loam, with a light clay subsoil, is to be preferred to any other. Heavy clay soil, or land with a hard-pan subsoil, or, in fact, any soil that is cold and wet, is totally unfit for profitable asparagus growing, unless it is thoroughly underdrained and made lighter by a plentiful addition of sand and muck.

Freedom from weeds is very desirable, even more

so than great fertility, for the latter can be produced by heavy manuring, which the future cultivation will require; and to the end that weeds may be few, it is well that for a year or two previous to planting the land should have been occupied by some hoed crop, such as potatoes, beets, cabbage, etc. Land on which corn has been growing for two or three years is in excellent condition for an asparagus field, provided it has been heavily manured one year previous to the planting of the roots.

PREPARATION OF THE GROUND

Asparagus differs from most other vegetables in that it is a perennial, and when once planted properly, in suitable soil, it will continue to produce an annual crop for a generation if not for an indefinite period, while if the work is done carelessly and without consideration for the plant's requirements the plantation will never prove satisfactory and will run out entirely in the course of a few years. The establishing of an asparagus bed is naturally more expensive than the planting and raising of annual vegetables. In addition to this, the plants have to be taken care of for three years before a crop can be harvested. On the other hand, an asparagus bed is an investment for a lifetime, and the dividends derived from it increase in proportion to the care and thoroughness bestowed upon the preparation of the land.

It is at once apparent, then, that nothing should be neglected to bring the soil into the best possible condition before planting. This truth was fully recognized by the gardeners of former years who practiced

most extraordinary methods in order to bring the land into the most favorable condition for asparagus. Even now in some European countries, where labor is cheap, the entire ground is trenched to a depth of three or four feet, turning in at the same time all the available manure, seaweed, and other fertilizing material.

A famous old-time asparagus bed in England was made in this manner: "The land was trenched three feet deep in trenches three feet wide and cast up into rough ridges, after a crop of summer peas. All decaying vegetation in the rubbish yards and corners was at the same time well sorted and turned up. Early in autumn also were added some old mushroom, melon, and cucumber bed material, a lot of manure from piggeries, cow houses, and stables, a quantity of road-grit and sand, a quantity of ditch and drain parings, turfy loam and sods, quite three feet thick. These were all turned over four times and well incorporated together, between Michaelmas and Lady Day, as one would a dungheap, the whole being left in large ridges exposed to the frost. By April this compost was in a kindly state; it was, therefore, laid down and planted with good, clean one-year-old asparagus plants, which certainly grew in a most extraordinary way."

Another elaborate way of making an asparagus bed, formerly practiced in France, is described by Dr. Macculloch as follows: "A pit the size of the intended plantation is dug four feet in depth, and the mold taken from it must be sifted, taking care to reject all stones, even as low in size as a filbert nut. The best part of the mold must then be laid aside before making up the beds. The materials of the bed are then to be

laid in the following proportions and order: Six inches of common dunghill manure, eight inches of turf, six inches of dung as before, six inches of sifted earth, eight inches of turf, six inches of very rotten dung, eight inches of the best of earth. The last layer of earth must then be well mixed with the last of dung. The compartment must now be divided into beds five feet wide by paths constructed of turf two feet in breadth and one foot in thickness."

A bed prepared in this manner, and planted and cultivated with as much painstaking care, will no doubt produce asparagus of unsurpassed quality, and may last forever. Yet the use of modern implements and a better knowledge of the nature and requirements of the plant have demonstrated that first-class asparagus can be produced with far less expense and labor. While a deep and loose soil produces earlier and better crops than a heavy and shallow one, indiscriminate deepening of the soil by trenching or other means is not always desirable, even where the cost does not come into consideration. When the subsoil is very light and poor and deficient in humus, the placing of the better surface soil below and the infertile lower strata above, trenching would be a positive detriment. The same would be the case where the subsoil consists of heavy impervious clay.

In the fall preceding planting the land should be plowed deeply and left in the rough state during the winter. Subsoiling has often been recommended, yet practical growers but rarely make use of the subsoil plow in the preparation of asparagus plantations, although the value of subsoiling where the subsoil is

heavy can not be doubted. Where stable or barnyard manure can be had cheaply, and the soil is heavy, a liberal coat spread broadcast over the surface and left to the action of the weather during winter will ameliorate the ground considerably. In most cases, however, the same object may be obtained by applying the manure in spring. Joseph Harris mentions a case in which a bed was plowed and subsoiled in the fall and the soil filled with manure, while another bed near by was planted without manure, or extra preparation of any kind, relying entirely on artificial fertilizers after planting, and the latter was by far the better bed. As early in spring as the ground is in suitable condition to be worked it has to be plowed and harrowed and brought into as perfect condition as possible.

VIII

PLANTING



THROUGHOUT the Middle and Northern States, spring, as soon as the soil can be worked to good advantage, is decidedly the most favorable time for planting asparagus. If it is not practicable to plant thus early, the work may sometimes be delayed up to the middle of June. In planting thus late, however, preparation has to be made for watering the plants in case of drouth, else failure be inevitable. It is also necessary to do the work as expeditiously as possible, so as not to expose the roots to the drying influences of the sun and wind. Fall planting is advisable only in climates where there is no danger of winter-killing of the roots.

After the ground has been plowed and harrowed, or spaded and raked over, and brought into as mellow a condition as possible, the rows for planting are to be laid out. It is usually recommended to have the rows run north and south, so as to readily admit the sunlight. When this is not practicable, however, it need not deter any one from making an asparagus bed, as it is more important to have the rows run with the slope of the land than in any particular direction of the compass, in order to provide ready surface drainage.

DISTANCE TO PLANT

As to the best distance between the rows and the plants in the rows there is a wide difference of opinion, more so than with almost any other cultivated plant. No unvarying rule can be laid down on this point, as it depends largely upon the mechanical condition, depth, and fertility of the soil. In a rich, moderately heavy soil, the roots may be planted closer than in a poor, light soil. The tendency of the present day is for giving the plants considerably more room than what formerly was thought to be ample. Intelligent observers could not fail to notice that crowded asparagus beds produce later and smaller crops, and of inferior size and quality ; that they do not last as long; and that they are more liable to attacks from insects and fungi than when more room is given to the plants.

Gardeners of but a few decades ago had no idea of the possibility of raising a profitable crop of asparagus planted four or five feet apart, and would have looked with derision upon any one advocating so wild a scheme. The remains of run out, old-time asparagus beds are still in evidence in many old farm gardens. The rows in these were originally one foot apart and the plants in the rows even closer than this, and perhaps after every third or fourth row there was a path two feet wide. Of course, in such a bed, after a few years, the entire ground became a solid mass of roots, and the stalks became smaller and tougher from year to year.

In most asparagus sections special customs prevail, and even in these different growers have their indi-

vidual preferences ; but all agree that asparagus should never be planted closer than two feet in rows three feet apart. For the home garden there is no better plan than to plant but a single row, with the plants

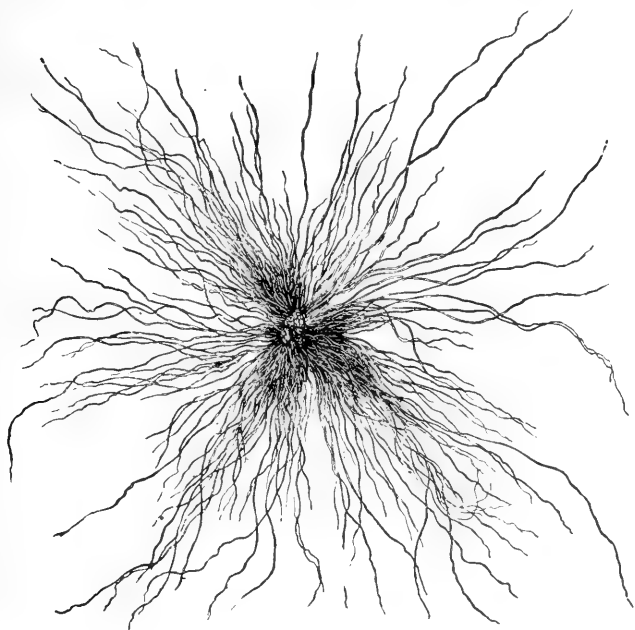


FIG. 14—HORIZONTAL DEVELOPMENT OF A FOUR-YEAR-OLD
ASPARAGUS ROOT

two or three feet apart, along the edge or border of the ground, but not nearer than four or five feet to other plants, and in case of grape-vines even more room should be given. Here they require but little care, and the plants have an unlimited space for the

extension of their roots in search of moisture and food. Asparagus needs considerable water, and an acre of land will hold so much water and no more. The more plants there are on an acre the less water there will be for each plant, and what is true of water is also true of plant food.

In field culture the distance adopted by asparagus growers varies from 3×3 feet (4,840 plants per acre); 3×4 feet (3,640 plants per acre); 4×4 feet (2,722 plants per acre); 4×5 feet (2,178 plants per acre); 5×6 feet (1,452 plants per acre); 6×6 feet (1,210 plants per acre), and even more. If the idea is to have the plants so far apart that their roots can not interlace, twenty feet each way would not be too extravagant a distance, under favorable conditions, as will readily become apparent by a glance at Fig. 14. This illustration is an exact reproduction of the root system of an asparagus plant four years from the seed. The roots spread out upon a level floor measured thirteen feet from tip to tip, the single roots averaging the thickness of a lead pencil. This root grew in Madison County, Ill., and was washed out of the ground—without having any of its roots torn—by the unusually heavy spring rains which caused the Piasa River to overflow its banks and sent a current rushing through the asparagus field in which it grew. If the plant had remained in its position a few years longer its roots would probably have extended ten feet in each direction.

From this it does not follow, however, that asparagus should be planted twenty or even ten feet apart to produce the largest returns, but it plainly shows why

the roots should not be planted as closely together as was customary in former years; and it obviously demonstrates that when land is cheap and manure and labor high, asparagus can not be hurt by giving it plenty of room. It should also be considered that earliness, size, and quality make a great difference with the price and profits when early and large shoots are in demand. It might be possible to get double the number of shoots per acre from thick than from thin planting, but they might be so small and spindling as not to be worth the labor and expense of cutting and marketing.

DEPTH OF PLANTING

Contrary to the all but universal belief, asparagus is not a deep-rooted plant. In the wild state its most frequent habitat is on the fertile marshes of the shoreline in Europe, on ground but a few inches above the tidewater which permeates the sandy subsoil. As the roots can not live in water, they naturally grow to long distances parallel with the surface and retain this habit under cultivation. The tendency of growth in the asparagus roots in this direction is obviously demonstrated in Fig. 14.

The proper depth of planting asparagus roots varies somewhat, according to the character of the soil, the method of cultivation, and the kind of spears desired, whether white or green. As the new crowns rise somewhat above the old ones annually, it seems but rational that the plants should have sufficient room for the new growths before their crowns become even with the surface of the land. When the crown once comes near the level of the soil it is impossible to give proper

cultivation, unless the entire bed be raised by adding soil to the whole surface.

While it is true that the deeper the crowns are planted the later they will start in the spring, this is of account only during the first few years. Besides, the factor of earliness is not of nearly as much importance now as it was before northern markets were so bountifully supplied with the southern grown crops several months before the opening of the northern season. Shallow-planted asparagus sprouts earlier, but soon exhausts itself, sending up spindling, tough shoots, while the deeper-planted crowns produce large and succulent sprouts throughout the season. When green asparagus is desired, and there is no danger of the beetles eating the sprouts before they are fit for use, a depth of two or three inches is sufficient, but for white or blanched asparagus a depth of from eight to ten inches is necessary.

MANNER OF PLANTING

As in other details of asparagus culture, the methods of planting have undergone very material changes. The formerly usual practice of digging deep trenches was not well founded—in the light of our present experience and knowledge—and could be useful only for drainage. How little regard was paid to the nature and requirements of the plant may readily be perceived by reading the following directions for making an asparagus bed, but little over half a century ago, in Bridgeman's "Young Gardeners' Assistant":

"The ground for the asparagus bed should have a large supply of well-rotted dung, three or four inches

thick, and then be regularly trenched two spades deep, and the dung buried equally in each trench twelve or fifteen inches below the surface. When this trenching is done, lay two or three inches of thoroughly rotted manure over the whole surface, and dig the ground over again eight or ten inches deep, mixing this top-dressing, and incorporating it well with the earth.

“In family gardens it is customary to divide the ground thus prepared into beds, allowing four feet for every four rows of plants, with alleys two feet and a half wide between each bed. Strain your line along the bed six inches from the edge ; then with a spade cut out a small trench or drill close to the line, about six inches deep, making that side next to the line nearly upright ; when one trench is opened, plant that before you open another, placing the plants upright ten or twelve inches distance in the row, and let every row be twelve inches apart.

“The plants must not be placed flat in the bottom of the trench, but nearly upright against the back of it, and so that the crown of the plants must also stand upright, and two or three inches below the surface of the ground, spreading their roots somewhat regularly against the back of the trench, and at the same time drawing a little earth up against them with the hand as you place them, just to fix the plants in their due position until the row is planted ; when one row is thus placed, with a rake or hoe draw the earth into the trench over the plants, and then proceed to open another drill or trench, as before directed, and fill and cover it in the same manner, and so on until the whole

is planted ; then let the surface of the beds be raked smooth and clear from stones, etc.

“Some gardeners, with a view to having extra large heads, place their plants sixteen inches apart in the rows instead of twelve, and by planting them in the quincunx manner—that is, by commencing the second row eight inches from the end of the first and the fourth even with the second—the plants will form rhomboidal squares instead of rectangular ones, and every plant will thus have room to expand its roots and leaves luxuriantly.”

In diametrical contradistinction, and as an example of the very plainest and simplest of modern methods, Joseph Harris wrote : “If you are going to plant a small bed in the garden, stretch a line not less than four feet from any other plant, and with a hoe make holes along the line, eighteen inches or three feet apart, four inches deep, and large enough to hold the plants when the roots are spread out horizontally. Do not make deep holes straight down in the ground and stick the roots in as you would a cabbage, but spread out the roots. After the roots are set out cover them with fine soil, and that is all there is to it. Then move the line three feet from the first row and repeat the planting until the bed is finished. In the field make the rows with a common corn-marker, three feet apart each way, and set out a plant where the rows cross. It is but little more work to plant an acre of asparagus than an acre of potatoes.”

Between these extreme methods many different directions for planting asparagus have been given and practised. Modern methods have not only greatly

simplified the planting, but have also materially reduced the expense, increased the crop, and improved the quality of the product.

After the ground has been properly prepared, it is marked off in parallel rows from three to five or more feet apart, according to the preferences of the grower. The easiest way to open these trenches is by plowing a furrow each way, and, if necessary, going over the ground a sufficient number of times to make the

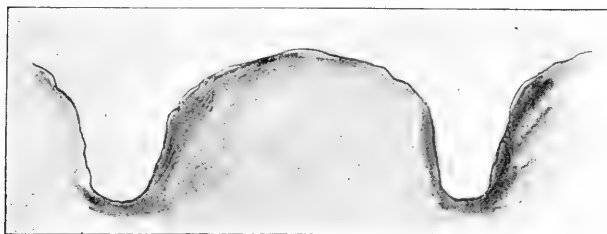


FIG. 15—TRENCHES READY FOR PLANTING

furrows from eight to ten inches deep. After this the loose soil is thrown out with a shovel or a wide hoe, so as to leave the trenches at a uniform depth of ten to twelve inches and of the same width at the bottom, as seen in Fig. 15. By rigging a piece of board on the mold-board of the plow more soil is thrown out, so that usually it will not be necessary to go over the ground oftener than twice. The Messrs. Hudson & Son, of Long Island, have devised for their own use a "trencher" (Fig. 16), which with a good team opens the trench to the desired depth in one operation and at a great saving of labor.

If the entire ground has been heavily fertilized, plowing manure in the trenches will not be necessary, yet many experienced asparagus growers think that it pays to scatter some fertilizing material into the trenches before planting. A favorite plan with Long Island growers is to mix half a ton of ground bone, or fish scrap, with one hundred pounds of nitrate of soda per acre, and thoroughly incorporate this mixture with

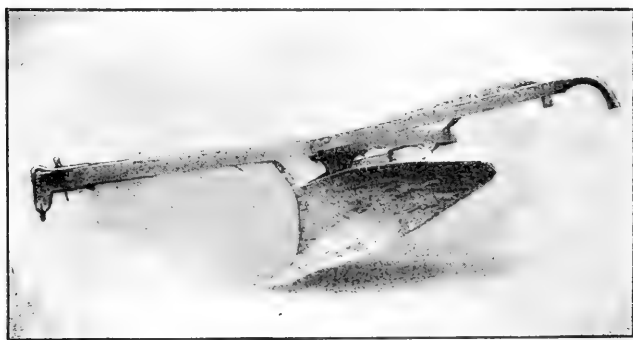


FIG. 16—HUDSON'S TRENCHER

the soil to a depth of three inches before setting the plants. Others prefer thoroughly decomposed manure spread over the bottom of the furrow, to a depth of about three inches, before setting the plants. Others prefer thoroughly decomposed manure spread over the bottom of the furrow, to a depth of about three inches, and covering it with two inches of fine soil. If the roots are to be planted four or more feet apart it will be sufficient to throw a shovelful of manure where the roots are to be placed. This is then spread out so as to

make a layer of about three inches, which is then covered with soil.

PLACING THE ROOTS

The proper planting of the roots is the most critical point in asparagus culture, as upon the manner in which this is performed—more than upon other detail—depends the success, yield, duration, and profit of the plantation. Almost any other neglect can be remedied

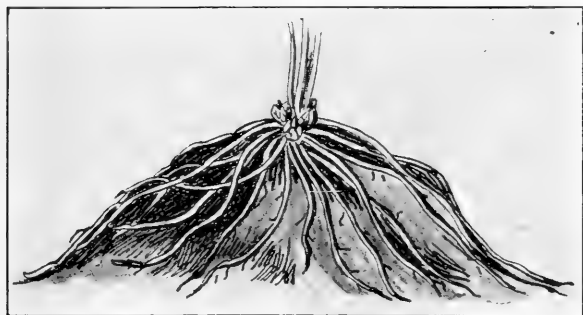


FIG. 17—ASPARAGUS ROOT IN PROPER POSITION FOR COVERING

by after-treatment, but careless and faulty planting, never. Whatever care and personal attention the grower may give to this work will be repaid manifold in future returns.

As stated before, only strong, healthy one-year-old plants with three or four strong buds should be used, so as to insure an even growth over the entire field, and at every stage of the work great care must be taken not to expose the roots to the drying influences of sun and winds. When everything is in readiness for planting, the roots are placed in the trench, the crown in the

center and the rootlets spread out evenly and horizontally, like the spokes of a wheel, and at once covered with three inches of fine, mellow soil, which is pressed around them. If the ground is dry at planting-time it should be pressed down quite firmly about the roots, so as to prevent their drying out, and to hasten their growth.

To still more insure success it is an excellent plan to draw up little hills of soil in the bottom of the

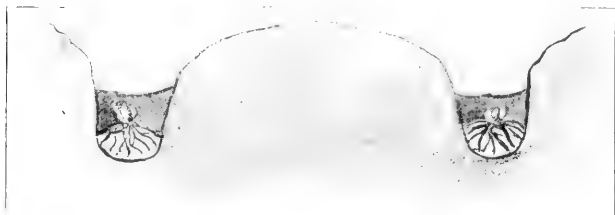


FIG. 18—CROSS-SECTION OF ASPARAGUS BED AFTER PLANTING

trench over which to place the roots with the crowns resting on the top, thus raising the crowns a few inches above the extremities of the roots and providing for them a position similar to what they stood in before transplanting, as seen in Fig. 17.

The subsequent covering of the roots can usually be done with a one-horse plow, from which the mold-board has been removed, passing down the sides of the row. This leaves the plants in a depression, the soil thrown out in opening the rows forming a ridge on each side, as shown in Fig. 18. This depression will gradually become filled during the process of cultivation the succeeding summer.

IX

CULTIVATION



AS GENERALLY understood, the chief object of cultivation is to kill weeds. This is an erroneous idea, however, as the appearance of weeds serves simply as Nature's reminder of the necessity of immediate cultivation. On ground cultivated as thoroughly as it should be for the best development of the crop there will rarely be any weeds to kill, as their germs have been destroyed by the process of cultivation before they could make their appearance above the ground.

CARE DURING THE FIRST YEAR

The cultural work in the asparagus bed during the first year consists in loosening the soil at frequent intervals, and especially as soon after rain as the ground becomes dry enough for cultivation. Frequent and thorough cultivation is necessary not only to keep down the weeds, but also to prevent the formation of a crust on the soil after rain, and to provide a mulch of loose earth for the retention of moisture. In field culture the work is best done with a one-horse cultivator or a wheel-hoe, and on a small scale with a scuffle-hoe and a rake. As the sprouts grow up small quantities of fine soil should be drawn into the

trenches from time to time, but during the early part of the season great care must be exercised not to cover the crowns too deeply.

Some growers advise to work the soil away instead of toward the plants, considering the four inches of soil with which the roots are covered at planting sufficient for the first year. While this may be true in a wet or moderately moist summer, in a season of drouth the additional mulch of mellow soil can not but be beneficial to the young and tender plants. Especial care is required when working around the young sprouts, so as not to cover, break, or in any way injure any of them.

In the garden bed it pays to stake the canes when they are but a foot high, so as to prevent the wind from disturbing the stools in the soil by swaying the shoots backward and forward. Careful gardeners insert stakes for this purpose at the time of planting, before the roots are covered with soil, so as to guard against the danger of injuring any of them. The best material for this tying is raffia, or Cuban bast. In field culture staking is usually not practicable, partly on account of the cost, and also because where there are many plants growing close together they furnish some mutual protection to one another. The same end may also be accomplished—partly, at least—by throwing up a furrow on each side of the rows of plants. Precautions of this kind are important in localities exposed to high winds, as their neglect may often cause greater loss than it would have cost to provide proper protection.

Another important work in the asparagus bed

during the first year is to keep close and constant watch over the asparagus beetle, and at its first appearance to apply the remedies recommended in the chapter on injurious insects. Plants deprived of their foliage at this early stage of their life have but a poor chance to recover from the loss.

If it is found that some of the plants have not started by the middle of June, it is best to replace them with growing plants of the same age, which should have been kept in a reserve bed for this purpose. If this replanting is done carefully, so as not to mutilate any of the roots, and on a cloudy day, it is best not to cut back the tops very severely. Unless a copious rain sets in soon after planting, the roots have to be heavily watered, after which they will keep on growing at once without suffering any setback.

The formerly all but universal practice was to cover the roots with manure after the stalks had been removed in the fall for fear of frost injuring or killing the roots. In sections where winters are very severe this may still be desirable, as may be seen from the statement of so keen an observer as Professor J. C. Whitten, of the Missouri Experiment Station: "Most writers advise applying dressing of old fine manure during the growing season when the plants can use it. In our soil better results are obtained by applying it in winter. It prevents the soil from running together and hardening, and also prevents the sprouts from coming through, as they otherwise often do, too early in spring, and becoming weakened by subsequent severe freezing."

As the reverse of this plan, M. Godefroy Lebœuf, the famous French authority, recommends "to clear out of the trenches the soil which has fallen into them from the sides of the mounds, and also remove from above the stools a portion of that with which they were covered at the time they were planted—say, to a depth of one and one-half inches—so that the action of the frost may open the soil and that the rain may penetrate and improve it; also that during the first fine days of spring the sun may warm the surface of the soil and penetrate as far as the stools. There is no fear that the action of the frost should hurt the plants. Asparagus will never freeze as long as the stool is covered with a layer of soil one and one-half to one and three-fourth inches in depth."

If the rows are not less than four feet apart a crop of some other vegetables may be raised between them. Beans, dwarf peas, lettuce, beets, or any kinds which do not spread much, are suitable for the purpose. These by-products will help considerably toward paying the cost of cultivating the main crop, besides having a tendency to keep the soil cool and moist, a condition of no little importance to the asparagus.

CARE DURING THE SECOND YEAR

The treatment of the asparagus plantation during the second year does not differ materially from that of the first season after planting. The ground has to be stirred frequently and kept scrupulously clean, and a sharp lookout must be kept for the advent of injurious insects. As soon as berries appear on the tops they should be stripped off and destroyed, as the ripening

seed absorbs a large share of the nourishment which ought to go to the development and strengthening of the crowns which are to produce the following year's crop.

Even with the best of care, some plants will die out from time to time, although the more thoroughly the ground has been prepared at the time of planting, and the better the quality of the roots planted, the fewer failures of this kind will occur. These blank spaces are not only constant eyesores to the methodical gardener, but in the course of several years the aggregate shortage of crops will be considerable, while the amount of labor and fertilizer will be the same as in a fully stocked plantation. Therefore, such vacancies should be filled in the spring, not only of the second year, but whenever they occur in future seasons.

The best way to replant these dead or dying roots is to go over the rows each fall, before the ground freezes, and drive a stake wherever there is a plant missing, as in the spring, before the plants have started, it would be difficult, if not impossible, to indicate the blank spaces. For replanting in the second year good strong two-year-old roots should be used. For the third and future years it is best to raise and keep a supply of a sufficient number of reserve plants for this special purpose in a similar manner as is done for forcing. As early in spring as the season permits these clumps should be carefully lifted and transferred to the permanent plantation. For three-year and older beds good strong three-year-old roots should be used, as younger ones would have but a poor chance between two older and well-established clumps.

CARE DURING THE THIRD AND FUTURE YEARS

The third year cutting may begin in a moderate way, but too much should not be attempted. If all the conditions of growth have been favorable half a crop may be cut without injuring the roots, but under no circumstances should cutting in the third year be continued for more than three weeks. The general care of the bed during the third year is similar to that of the second, with the exception that the soil is worked more toward the rows, ridging them slightly.

In the spring of the third and each succeeding year, as soon as the ground can be worked it should be plowed between the rows, turning the soil toward and over the crowns, leaving a dead furrow between the rows, as seen in Fig. 19. If bleached asparagus is desired, these ridges over the rows should be twelve inches higher than the bottom of the dead furrows between the rows, and when the soil is very light and sandy a height of fifteen inches is preferable. For green asparagus the ridges are left lower, and the shoots are allowed to grow several inches above the ground before cutting, provided the asparagus beetle does not appropriate them sooner.

After the furrows are plowed out between the rows a home-made ridger is used to smooth the ridges and complete the work. This is formed of two heavy oak boards shod with tire iron, sloping upward and backward, attached to a pair of cultivator wheels. This requires a good team, one horse walking on either side of the row. On the light soils of Long Island this implement works to perfection, but on stiff

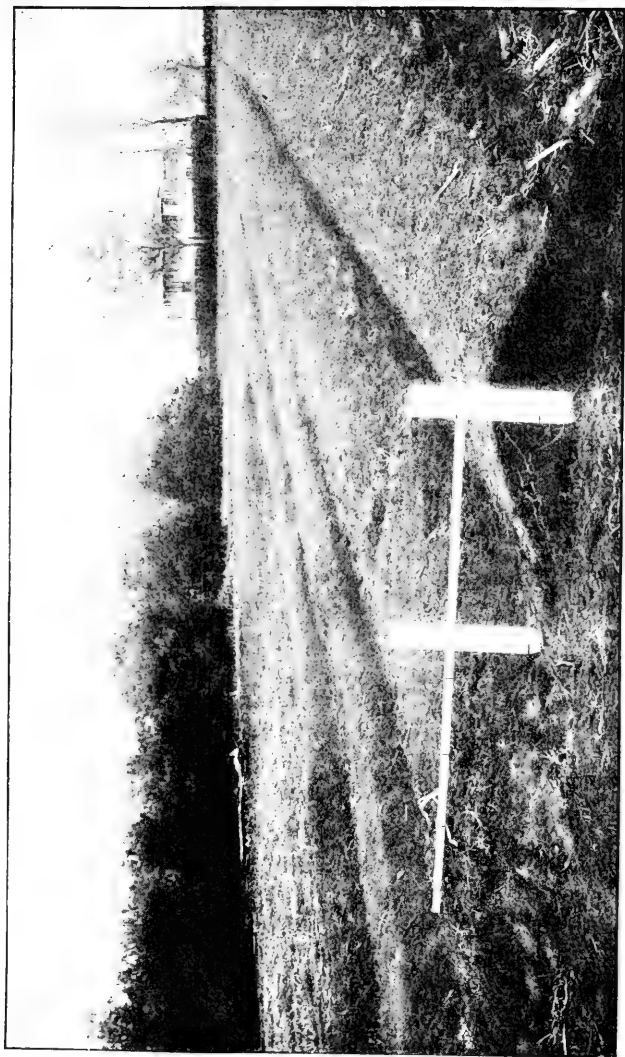


FIG. 19—PERSPECTIVE VIEW OF AN ASPARAGUS FIELD PROPERLY RIDGED IN EARLY SPRING
MISSOURI AGRICULTURAL EXPERIMENT STATION

lands a two-horse disk-wheel cultivator, with two disks on each side, going astride of each row and throwing up fresh soil upon the ridge, proves more effective. The same implements are used for renewing the ridges during the cutting season, which will be required about once a week, as the rains beat them down and the sun bakes a crust upon the top.

Immediately after the cutting season is over the ridges are leveled, by plowing a furrow from each side of the center (Fig. 20), after which the land is harrowed crosswise until the surface is level and smooth. As long as practical, surface cultivation should be given, especially after rains, but usually at this time the plants make such rapid and vigorous growth that there will be little time for the work. Their tops and branches soon fill the entire space and quickly shade the ground so densely as to keep down weed growth. Of course, whatever tall weeds may spring up here and there have to be pulled out by hand.

FALL TREATMENT

The fall clearing of the plantation is an important part of asparagus culture. As soon as the berries are turning red—but not before—the stalks should be cut off even with the ground. If left longer the berries will drop off, their seeds will soon become embedded in the ground and fill the soil with seedling asparagus plants, which are about the most obstinate weed in the asparagus bed. If cut sooner they are not sufficiently matured, and the roots are deprived of their nourishment. All the brush should be removed at once to an open field and burned, so as not to provide lodging-

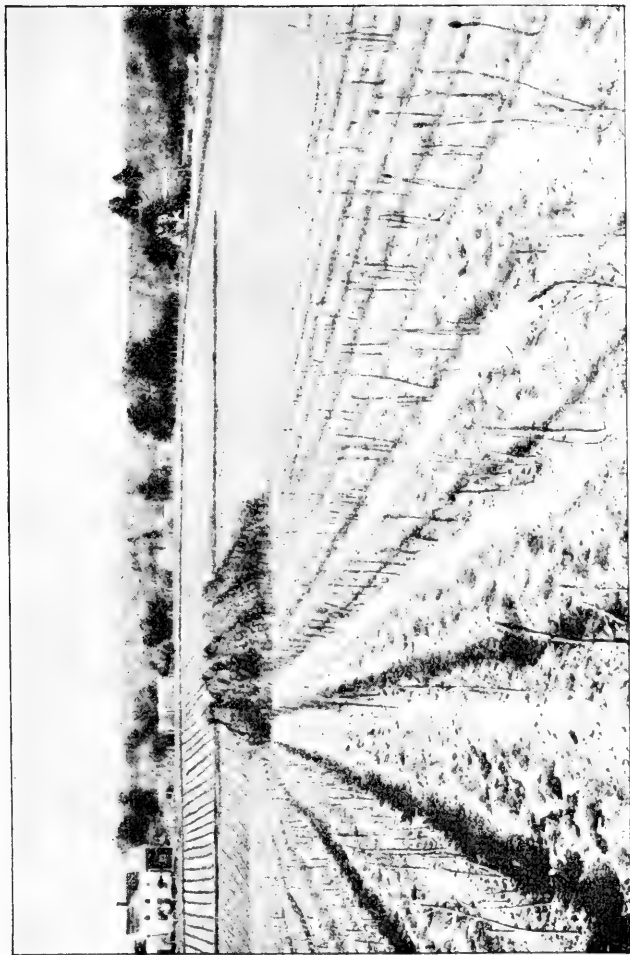


FIG. 20—LEVELING THE RIDGES AFTER THE CUTTING SEASON

places for injurious insects and fungi. Some recommend leaving the seedless plants as a mulch during the winter, but the possible benefit of this is so insignificant that it is not worth while to leave them for a second cleaning in spring, when time is far more valuable.

RENOVATING OLD ASPARAGUS BEDS

The principal causes of asparagus beds running out are that in the first place ten plants are set out in a space where only one could thrive; then that the ground is not rich enough and had no proper cultivation; and last, but not least, that the cutting of the stalks has been carried to excess. What to do with the old bed is sometimes a perplexing question, especially when a place changes hands and the new proprietor has more progressive ideas than the former one had.

Let the old bed stay, and set out a new one according to rational methods. Some years ago the writer came into possession of an asparagus bed which was known to be forty years old, and may have been much older. It was a solid mass of roots without any distinguishable rows. The spears produced were so small and tough that the first impulse was to dig up the roots. But as this proved to be a more formidable task than was anticipated, another plan was pursued. In autumn the bed was thickly covered with fine yard manure. The following spring the bed was marked out into strips of two feet in width. When the sprouts appeared those in every alternate strip were cut clean off during the entire summer, and the others allowed to grow. In the autumn of the year another

heavy application of manure was given to the entire bed. The following year but few shoots appeared in the strips which had been cut all through the summer. These were treated the same as before, and in the third year not a sprout appeared in the alleys. The stalks left for use improved greatly during the first year and the third year were of good serviceable size and quality, so that even after the new bed, which had been planted at the time this experiment was commenced, came into bearing, the old one was retained for several years longer. Probably if the vacant strips had been made three or four feet wide the result would have been still better. This experience suggests the idea that the easiest and least expensive way of exterminating an old asparagus bed is to persistently mow down all the shoots for a season or two.

X

FERTILIZERS AND FERTILIZING



SPARAGUS is a gross feeder. There is hardly another plant in cultivation upon the vitality of which so great a demand is made. The cutting of all its sprouts, or shoots, as soon as they appear above the ground, for several weeks, is an abnormal and enormous tax upon the plant, which is thus forced to extra exertion in order to reproduce itself and perpetuate its kind. Therefore, it should have the most tender care, and an abundance of nourishing and readily available food. The earliness, tenderness, size, and commercial value of the product depends principally on the rapidity of its growth, and, as this is materially promoted by the richness of the soil, it is evident that the plants should receive all the food they can assimilate during the growing season.

There is a wide difference of opinion among growers as to which is the best kind of manure to use. Whatever the individual preferences may be, there is this satisfaction to know that no kind of plant food can come amiss on the asparagus bed, although the use of some kinds and combinations may be more economical than others. Formerly animal manures only were thought to be of any use for asparagus, and there are still some growers who cling to this opinion. In recent years, however, there has been a decided reaction in this regard in some of the principal aspar-

agus sections. The objections made against stable manure are that it is more expensive to handle, that it is apt to get the land full of weeds, and that it does not contain sufficient phosphoric acid and potash. At present many growers use commercial fertilizers exclusively, convinced that asparagus needs liberal feeding of potash and more nitrogen than is generally supposed to be required.

The composition of 1,000 parts of fresh asparagus sprouts is, according to Wolff:

Water	933	parts
Nitrogen	3.2	"
Ash	5.0	"
Potash	1.2	"
Soda	0.9	"
Lime	0.6	"
Magnesia	0.2	"
Phosphoric acid	0.9	"
Sulphuric acid	0.3	"
Silica	0.5	"
Chlorine	0.3	"

This analysis shows very accurately what a given weight of asparagus abstracts from the soil, but it does not, and can not, show or even indicate certain indispensable demands. In this, as in other cases, the analysis of a crop is a very uncertain guide to its proper fertilization. It should be clearly understood by every cultivator of the soil that no rigidly fixed formulas can be given for any one crop on all soils. The question of quantity of application and of proportion must always, in the very nature of the case, remain more or less a matter of individual experi-

ment. The following formula, given by Prof. P. H. Rolfs, makes a good asparagus fertilizer :

Nitrogen	4 per cent.
Potash	5 "
Available phosphoric acid . . .	7 "

One thousand five hundred pounds of the above formula should be applied per acre. When possible apply twenty to forty tons of vegetable material, such as partially rotted rakings of barnyard manure. Where such vegetable matter is procurable, the quantity of nitrogen may be decreased proportionately. If manure is obtainable, allowance should be made for the fertilizing elements contained therein.

An excellent formula for one ton of asparagus fertilizer, given by Prof. W. F. Massey, consists of :

200 lbs.	nitrate of soda
700 "	cottonseed-meal
800 "	acid phosphate (13 per cent.)
300 "	muriate of potash

This will yield 4.9 per cent. ammonia, 6.1 per cent. available phosphoric acid, 8.4 per cent. potash.

The effects of the application of a scientifically balanced fertilizer ration upon asparagus is clearly illustrated in Fig. 21, which presents a photographic reproduction of an experimental plat of the North Carolina State Horticultural Society at Southern Pines, N. C., fertilized with

250 lbs.	nitrate of soda
400 "	acid phosphate
160 "	muriate of potash

per acre, while Fig. 22 shows a plat of equal size which remained unfertilized.



FIG. 21—NORTH CAROLINA'S EXPERIMENT FARM ASPARAGUS PLOT; FERTILIZED

The following table gives the amounts of different fertilizer materials necessary to give the desired quantity of each element :

<i>Element</i>	<i>Pounds of different materials for one acre</i>
Nitrogen . . .	{ 800 to 1,000 lbs. cottonseed-meal; or
	{ 350 to 400 " nitrate of soda; or
	{ 275 to 300 " sulphate of ammonia; or
	{ 400 to 600 " dried blood.
Potash	{ 300 to 500 lbs. kainit; or
	{ 150 lbs. muriate of potash; or
	{ 150 to 300 lbs. sulphate of potash
Phosphoric acid .	{ 750 to 1,000 lbs. acid phosphate; or
	{ 600 to 800 " dissolved bone.

"Asparagus requires very heavy manuring, and yet its composition would not indicate it," writes Mr. Charles V. Mapes. "The explanation is found in the fact that it must grow very rapidly, otherwise it is tough, stringy and flavorless, the same as with radishes. If it had a long season to grow in, like timothy hay, it might grow successfully in very poor soil. A half ton of timothy hay contains about as much plant food, and in similar proportions, as two thousand bunches of asparagus, or five thousand quarts of strawberries, and yet while this quantity of hay will grow on an acre of almost any poor soil, the strawberries or asparagus for a fair crop per acre require a rich garden soil. If the hay were obliged to make as rapid growth as the asparagus, then it also would require rich soil. With the strawberry there is but the lapse of a few weeks

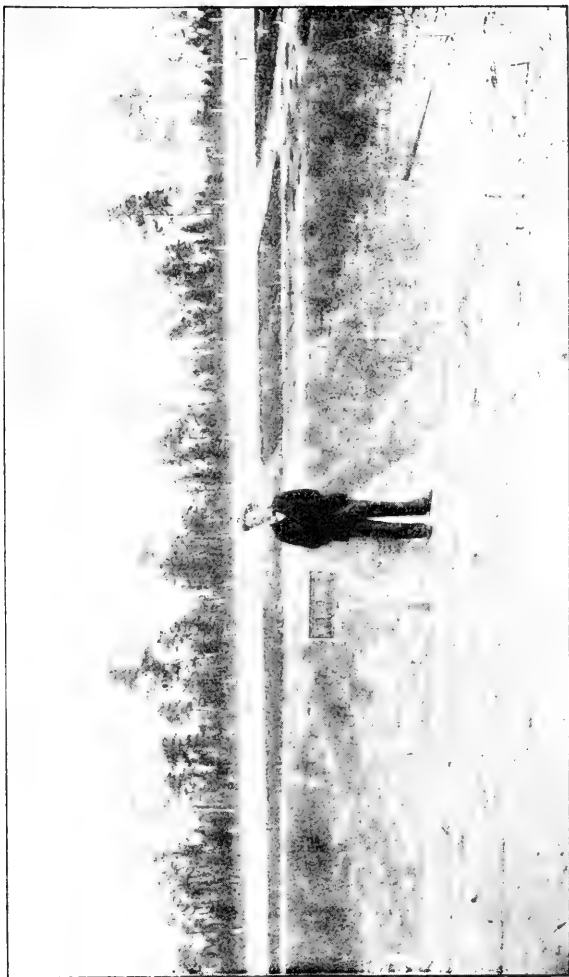


FIG. 22—NORTH CAROLINA EXPERIMENT FARM ASPARAGUS PLOT; UNFERTILIZED

from the time of blossoming to the full development of its fruit. The plants need a superabundance of plant food within easy reach, otherwise the fruit is small and inferior. The plant can not bear profitable fruit and at the same time be compelled to struggle for existence. The same is the case with asparagus. Neither of these crops can take up out of the soil all the fertilizer that needs to be applied for their successful growth, and therefore there is necessarily a large quantity of plant food unused and left over in the soil."

For these reasons, asparagus, while not necessarily an exhaustive crop, requires heavy manuring. One ton of high grade vegetable manure is none too much per acre, and is small, particularly in the expense, as compared with the larger quantities of stable manure per acre, as recommended by some successful growers. As already stated, formerly it was thought necessary to place large quantities of manure in the bottom of the deep trenches in which the young plants were set out, in order that sufficient fertility might be present for several years for the roots, as after the plants were once planted there would be no further opportunity to apply the manure in such an advantageous place. This theory has been found erroneous and the practice has been demonstrated to be rather a waste than otherwise, and besides the roots of asparagus thrive better when resting upon a more compact soil; nor is it necessary that the soil should contain great amounts of humus, or be in an extremely fertile condition when the plants are first put out, since by the system of top-dressing a moderately fertile soil soon becomes exceed-

ingly rich and equal to the demands which the plants make upon it.

The plan of top-dressing beds during the fall or early winter is gradually giving way to the more rational mode of top-dressing in the spring or summer. It was believed that autumn dressing strengthened the roots and enabled them to throw up stronger shoots during the following spring. This is a mistake, however. In the Oyster Bay region formerly all manuring was done in the spring, but the practice of applying all fertilizers immediately after the cutting is finished is rapidly increasing. The reason for this is found in the fact that, during the growth of the stalks, after the cutting season is over, the crowns form the buds from which the spears of next season spring, and it is probable that it is principally during this period that the roots assimilate and store up the materials which produce these spears. This being true, the plant food added to the soil and becoming available after the cessation of vegetation in the autumn can have little, if any, effect upon the spears which are cut for market the following spring; it first becomes of use to the plant after the crop has been cut and the stalks allowed to grow. Thus the manuring of the autumn of 1901 will not benefit the grower materially until the spring of 1903.

Nevertheless, some highly successful asparagus raisers continue to apply fertilizers in the spring, as evidenced by the following directions given by one of the most prominent growers in the Oyster Bay district: "After the roots have been set in the drill, put enough soil on them to cover about two inches.

Then sow about 500 pounds of high grade potato fertilizer per acre in the drill. As the weeds commence to grow, cultivate and hoe, letting the soil cave down in the drill. About the middle of the season sow about 500 pounds more of fertilizer in the drill. Continue to cultivate and hoe the remainder of the season. At the end of the season the drill should be entirely filled up. The second year sow about 2,000 pounds of fertilizer per acre broadcast, plow the ground and harrow it down level, and keep the ground clean. The third year open the drill over the asparagus with a one-horse plow, broadcast 2,000 pounds of fertilizer per acre about the time the shoots begin to show, and back-furrow it up with a plow over the drill to form a ridge. Then smooth the ridge down with a home-made implement resembling a snow-plow reversed. Cut every morning all the shoots that show through the ground. Do not cut more than four weeks in the first cutting season. Continue to broadcast 2,000 pounds of fertilizer per acre every year."

From what has been said in regard to the various methods of applying fertilizers to asparagus, it will be readily understood that it can make but little difference how it is distributed, whether on the rows, between the rows, or broadcast, so long as enough of it is put on the land. In an established asparagus bed the entire ground is a dense network of roots, and wherever the fertilizer is put some of the roots will find it, but not those of the plants over the crowns of which it has been planted; not more so than the feeding roots of an apple tree can reach a heap of manure piled around its trunk.

SALT AS A FERTILIZER

Salt is but little used now by commercial asparagus growers, though it has been recommended for this crop from time immemorial. About the principal advantage to be derived from its use is that of killing weeds without injuring asparagus, although it may be applied in sufficient quantities to injure the asparagus. The indirect fertilizing value of salt is mainly due to the fact that it has the power of changing unavailable forms of plant food into available forms; but this object may be secured cheaper and better by the use of kainit. In sandy soils it may encourage the supply of moisture, but on naturally moist and retentive soils heavy dressings of salt may do more harm than good.

Much of the benefits to asparagus for which salt gets credit is its use in a small way in the home garden, due to the fact that not dry salt, but the brine and residue of the pork and corned beef barrels is applied to the asparagus beds. This brine is rich in animal matter extracted from the meat, and usually also in saltpeter, which has been used in pickling. The latter substance alone, without the addition of salt, exerts a strong fertilizing effect upon the plants.

After a series of carefully conducted experiments by Mr. Charles V. Mapes, he writes :

“Salt was only effectual as a fertilizer in proportion as the soil contained accumulated supplies of plant food, either from previous manurings or from natural strength. Asparagus, unlike nearly all other crops, will stand almost unlimited quantities of salt without injury. It also thrives near the seashore,

and it was therefore generally believed that liberal quantities of salt were a necessity to its successful growth. Experience has shown, however, that its presence is not at all necessary for its growth, and that the reason that a bed to which salt has been applied shows quickened and improved growth is that the salt dissolves out of the soil plant food which, without the presence of the salt, would have become too slowly reduced to available condition for producing good crops. The salt acted practically as a stimulant and added nothing except chlorine and soda, neither of which in any considerable quantity is essential for growing this crop. It is this dissolving action that takes place in the soil whenever any soluble salt or fertilizer, like kainit, potash salts, acid phosphates, etc., be applied to the soil, that is often mistaken for a manuring one. The result is an exhaustion, not a strengthening, of the soil. The crop is grown at the expense of the limited supply of food that the soluble salt can act upon. The fertilizer has acted practically as a stimulant."

XI

HARVESTING AND MARKETING



THE chief labor in asparagus culture is the cutting and bunching. As it is of the greatest importance that the work be done promptly and expeditiously, it is desirable to have more help than is wanted merely for the asparagus, and then, when the asparagus is ready for market, they can go to hoeing and tilling other crops. Five acres in full bearing will require from six to eight men from four to six hours per day to do the cutting and three or four to do the bunching. A successful farmer in western New York, who has four acres of asparagus, employs eight or ten boys and girls, for from three to six hours per day, to do the cutting and three women to bunch it. The women are paid by the bunch, and work five to ten hours per day. Piece-work, if properly done, is nearly always cheaper than day work, and is better for the employés and the employer.

CUTTING

As has been stated in a previous chapter, cutting should not begin until the plants have become strong and vigorous, which requires two or three years from the planting. In the latitude of New York City the cutting season commences usually the last week in April and closes July 10th, although but few growers

cut after the 1st, particularly if the season has been a favorable one. Except on old and well-established plantings, cutting should not extend for more than six or seven weeks. Some growers cut asparagus as long as it pays to ship, regardless of the damage done to the plants. The old rule to discontinue cutting asparagus when green peas are abundant is a safe one to follow, especially in the home garden. Unlike other crops, about as much can be cut each day, or at each cutting, as the day before, during the season, varying only according to the weather.

Manner of cutting.—The mode of cutting asparagus varies according to the requirements of the markets, whether green or white stalks are desired. Whatever individual preferences may be, the fact is that in New York City, and some other large market centers, 75 per cent. of the asparagus sold is white or blanched, and it would be useless to try to persuade the buyers to take any other. To show how extreme the convictions are in this matter of taste, we quote from Prof. J. F. C. Du Pre, of the Clemson Agricultural College: "Why any one should prefer the almost tasteless, insipid white to the green 'grass,' into which the sunshine has put the flavor of ambrosia, is beyond my comprehension." On the other hand, Lebeuf, the famous asparagus expert of Argenteuil, writes: "Properly blanched asparagus is infinitely more tender and delicate than green. To serve up green asparagus is to dishonor the table."

In recent years a compromise has been made between the two styles. By allowing the tops of the hilled-up sprouts to grow four inches above the sur-

face, the upper half of the stalk is green while the lower half remains white.

For green asparagus the sprouts are cut when six or seven inches high, and then only so far below the surface as to furnish a stalk about nine inches long. For the white style the rows have to be ridged twelve inches above the crowns, and the stalks are cut as soon

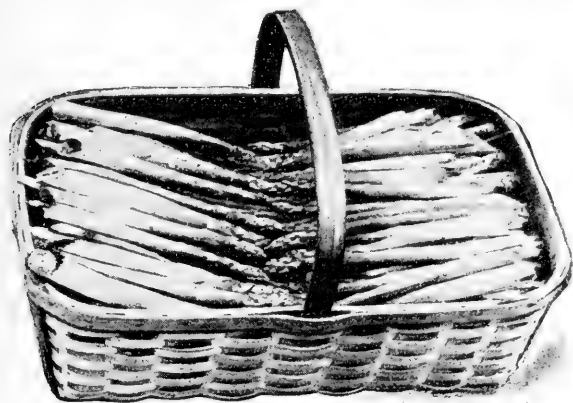


FIG. 23—BASKET OF ASPARAGUS READY FOR THE BUNCHING
SHED

as the tops show above the ground, the cutting off being eight or nine inches below the surface.

Whichever method is followed, it is very important to cut every day during the season, and to cut clean at each cutting, taking all the small sprouts as well as the large ones. If the weak and spindling shoots are allowed to grow they will draw away the strength from the roots, to the injury of the crop.

When cutting, the sprout is taken in the left hand

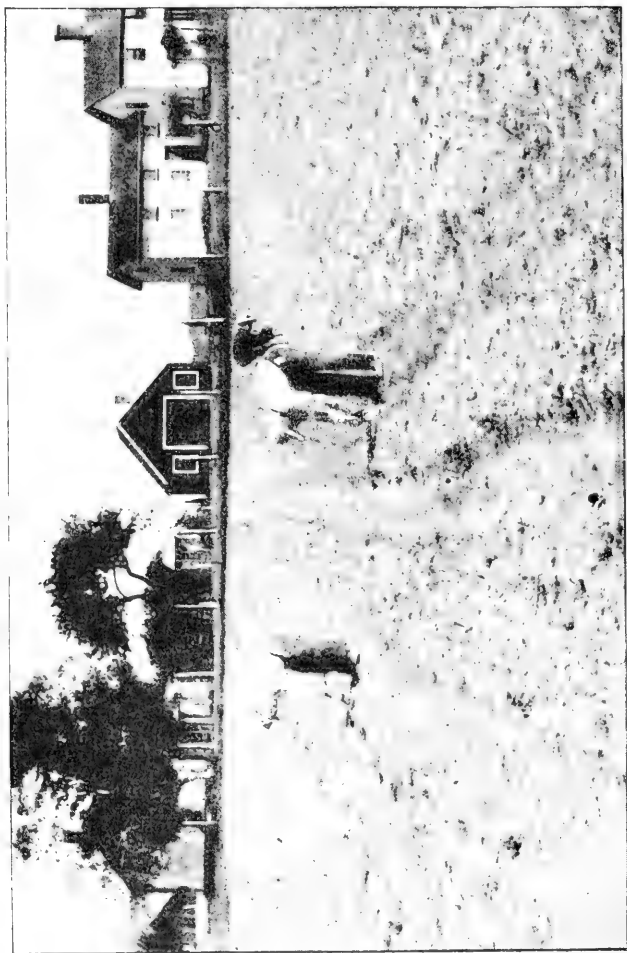


FIG. 24—CUTTING AND PICKING UP ASPARAGUS IN A TEN-ACRE FIELD OF C. W. PRESCOTT,
MIDDLESEX COUNTY, MASS.

and the knife run down close alongside of it to the proper depth, carefully avoiding other spears that are just beginning to push up all around the crown. Then the handle of the knife is moved away from the stalk, to give it the proper slant, the knife shoved down so as to sever the stalk with a tapering cut, and at the same time the stalk is pulled out. After cutting, the asparagus should be removed out of the sun as soon as possible to prevent its wilting and

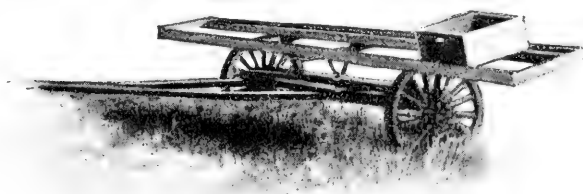


FIG. 25.—HORSE CARRIER FOR TEN BOXES OF ASPARAGUS

discoloring. Usually this is done by dropping the stalks in a basket which, when full (Fig. 23), is carried to the bunching shed. On large plantations, however, the cutters leave the stalks on the ground to be picked up by boys following closely, as seen in Fig. 24. To facilitate the picking up and carrying away, horse carriers are used, as shown in Fig. 25.

In some sections of Europe, especially at the famous asparagus regions of Argenteuil, a knife is never used. According to W. Robinson: "The slightly hardened crust around the emerging bud and on top of the little mound is pushed aside, the fore and middle finger

separated are then thrust deeply into the soft soil, pushing the earth outwards. If a rising shoot be met with on the way down, it is carefully avoided. A second plunge of the two fingers and pushing out of the earth usually brings them to the hardened ground about the crest of the root; the forefinger is then slipped behind the base of the shoot fit to gather, and pushed gently outward, when the shoot at once snaps clean off its base. This plan has the advantage of leaving no mutilated shoots or decaying matter on the ground. Once gathered, care is taken that the shoot is not exposed to the light, but placed at once in a covered basket. As soon as the stalk is gathered, the earth is gently and loosely drawn up with the hand, so as to leave the surface of the mound as it was before, not pressing the earth in any way, but keeping it quite free. The shoots are not rubbed or cleaned in any way—it would disfigure them, and they do not require it."

Knives.—There are several styles of knives for cutting asparagus, but an ordinary ten-inch butcher-knife with the point cut square off, leaving the end about an inch and a quarter wide and ground sharp like a chisel, answers the purpose as well as any of the implements made especially for the purpose. Another serviceable tool for cutting asparagus is a carpenter's thin firmer-chisel, one and one-half inches wide, nearly flat, and the thinnest that can be obtained ground on the convex side or back, about an inch from the end, which should be rounded off on the inside to prevent them from injuring sprouts near by. Other styles of asparagus knives are seen in Fig. 26.

SORTING AND BUNCHING

In some local markets asparagus is sold loose, by weight, in which case but little regard is paid to the size and length and color of the stalks, nor to the style of packing. This is the most profitable way for the grower to sell, as it saves him all the expense and labor of bunching, and as even the smallest stalks are thus

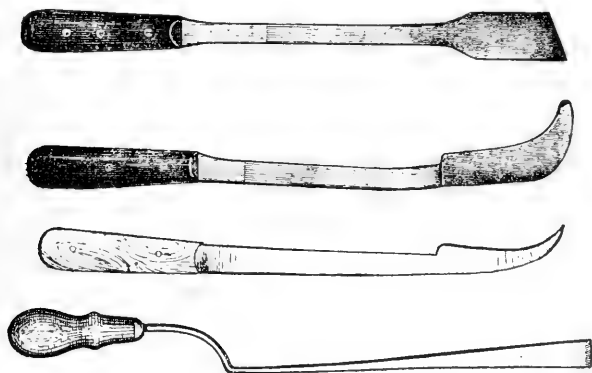


FIG. 26—VARIOUS ASPARAGUS KNIVES

salable, there is no waste whatever, while the prices obtained are about the same as those for first-class bunches—that is, two pounds of loose asparagus sell for about the same price as a full-sized bunch. But in city markets asparagus could hardly be sold in such a condition, and it is of first importance that it should be carefully graded and neatly bunched.

Sorting.—Careful growers assort into three sizes: extras, primes, and seconds. The size and weight of the bunches vary somewhat in different markets.

Bunches varying from six to twelve inches in length are received at wholesale centers, but the most convenient and popular size for a bunch of prime white asparagus is eight and one-half inches long, averaging thirty spears, and weighing two pounds. The side view of one and the end view of three bunches of this size of white asparagus are shown in Fig. 27. To assure uniformity some ingenious contrivances have

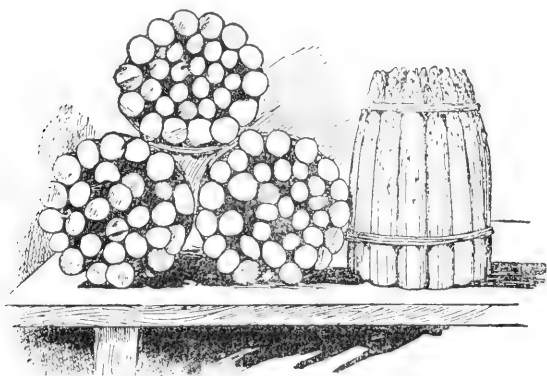


FIG. 27—END AND SIDE VIEW OF PRIME WHITE ASPARAGUS BUNCHES

been invented, most of which are a great improvement over the old-time bunchers, consisting merely of a board with four pins, six inches long, and placed about four inches apart each way, to form a square. Two strings, usually of bast matting, were laid down on the board, which was set on a bench up against the wall, or had a back made of another board tacked on it at right angles. The asparagus was laid on the buncher be-

tween the pins, the tops touching the back or wall to keep them even. When the bunch was large enough the strings were tied firmly, and the butt end of the bunch cut square.

Bunchers.—The modern bunchers are constructed of cast iron and are easily handled. One of the first to

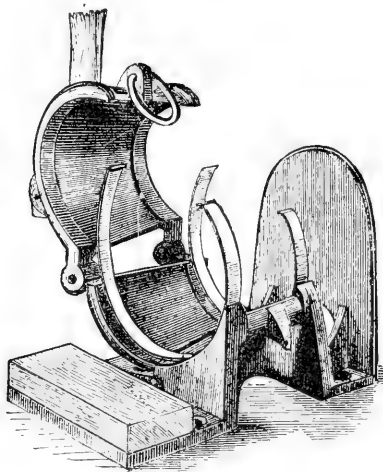


FIG. 28—CONOVER'S ASPARAGUS BUNCHER

come into use was Conover's (Fig. 28). The principle of the operation is that the stalks are placed between two brass strips, a hinged cover is brought down by means of a lever and held in place until the strings are tied. Two ties should be used, one placed about two inches from either end. The bunch must be tied so tightly that it will not loosen in handling and transportation to market. The Watt's Buncher (Fig. 29), used extensively in New Jersey, is so arranged that the

arms may be adjusted to any size bunch desired by simply loosening the bolts at either end, and pulling out the arms so as to fit the shape of the bunch, and thus both ends can be bunched properly. The style of buncher and knives in favor with growers in the famous asparagus region near Concord, Mass., are seen in Fig. 30, and the process of bunching in Fig. 31.

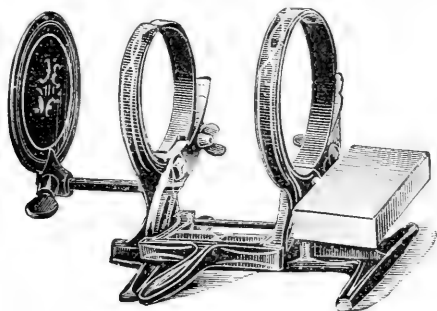


FIG. 29—WATT'S ASPARAGUS BUNCHER

Tying materials.—Twine, Cuban bast, sisal, and various other materials are used for tying, but nothing is better for this purpose than raffia fiber. This is obtained from the raffia or rofia palm, a native of the island of Madagascar. The tree sends enormous branches from near the ground, the pinnate leaves of which produce this fiber. One palm frond will produce eighty to one hundred long, green leaflets from two to five feet in length, and from this the fiber is prepared. "Silk lamba" is also a product of this palm. Raffia fiber is now extensively used for tying up plants, for grafting, and many other purposes, as it is very strong, as soft as silk, and is not affected by moisture or



FIG. 30—RACK AND KNIVES USED IN NEW ENGLAND

changes of temperature, and it does not break or ravel when folded or knotted.

Rubber bands.—The use of rubber bands for fastening asparagus bunches has recently been found to have some advantages not possessed by other materials. Prof. W. J. Green, of the Ohio Experiment Station, writes in Bulletin No. 9: "The work can be done more rapidly and better. The saving in time is fully one-third, which will pay for the increased cost of rubber over string, reckoning wages at seventy-five

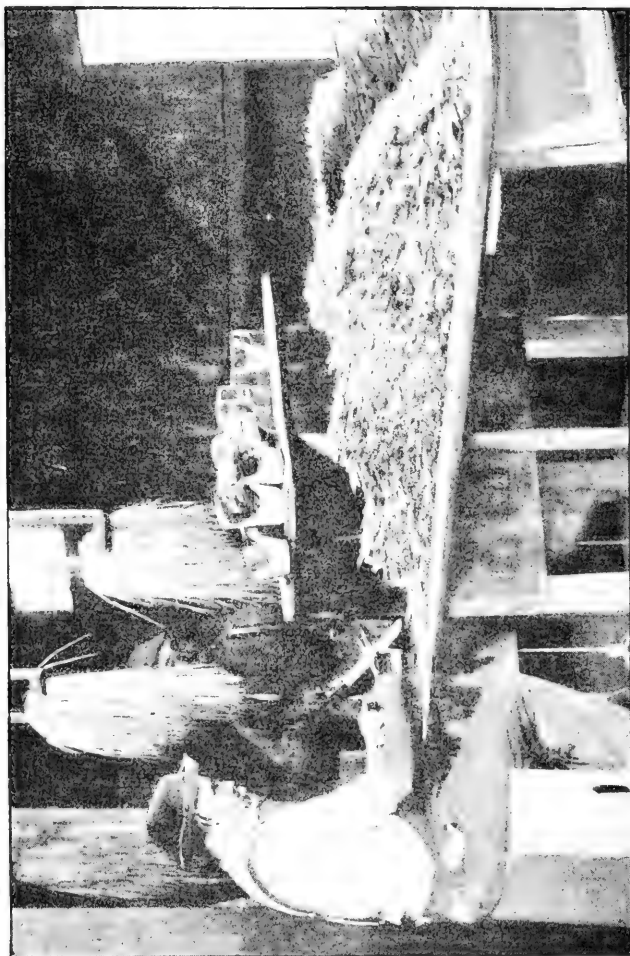


FIG. 31—AT THE BUNCHING TABLE

cents per day. This difference might be less where expert tyers are employed, or very low rates per hundred bunches are paid. In any case, the work can be done in a manner that is much more satisfactory to dealers with rubber than with string. This is owing to the fact that rubber holds the bunches intact, while string allows them to fall apart and to become unsightly. Doubtless, in some cases, dealers would be willing to pay more for bunches fastened with rubber than for those put up in the ordinary manner. Even though no difference is made in price for asparagus put up by the two methods, the bunches fastened with rubber bands sell more readily than those tied with string.

“Rubber bands can be bought for two dollars per pound, and the size best adapted to the purpose run about two thousand bands per pound, or sufficient for one thousand bunches. This makes rubber bands cost about two cents per dozen bunches more than string, if the saving in labor is not taken into consideration.

“The saving in the item of labor depends, of course, upon the kind of labor employed. In determining the relative value of the two methods not only must cost of labor be taken into consideration, but the character of the market as well. When competition is not strong careful bunching is not a matter of great importance, but in many markets it is essential that the bunches be put up in such a manner that they will not fall apart. In such cases rubber bands will more than pay for their extra cost, by insuring more ready sales, if not by increasing the price.

“The method employed in bunching with rubber

bands is to slip a band over an ordinary teacup—one with straight sides and without a handle; fill the cup with asparagus shoots, the heads downward, and then slip the band from the cup to the bunch. This makes a bunch of about the right size, and gives the upper end a nicely rounded appearance. All that remains to be done is to slip on another band and to square the butts with a sharp knife. Possibly a metallic cup would answer better, being thinner, but a teacup is not objectionable in this particular. If smaller bunches are desired than the smallest cup that can be found, it is not necessary to fill the cup."

MARKETING

During the entire process of cutting, sorting, bunching, and packing great care must be exercised not to bruise or in any way injure the heads, as the gummy juice of these soon heats and spoils the whole. They should also be kept cool and dry, else the moisture causes decay. Of course if, when cutting, the ground is wet, some of the soil will adhere to the lower ends of the stalks; this has to be rinsed off in clean water, but not by immersing the entire stalk.

If the bunches are to be kept over night, before packing, the butts should be dipped in clean water and stood on end on a cold cellar bottom, or upon grass or hay that has been thoroughly wet; but the crowns, or the green portions of the sprouts, should never be sprinkled or wet. It is a common practice to set the bunches in shallow pans containing water, but this is apt to give a bitter taste to the stalks.

Crates.—There is no standard shape or size of

crates for shipping asparagus, and in the wholesale markets of New York City a great variety of styles is found. Of late ordinary twenty-four or thirty-two quart berry crates have come into favor with near by growers, as they are cheap, light, and easily handled.

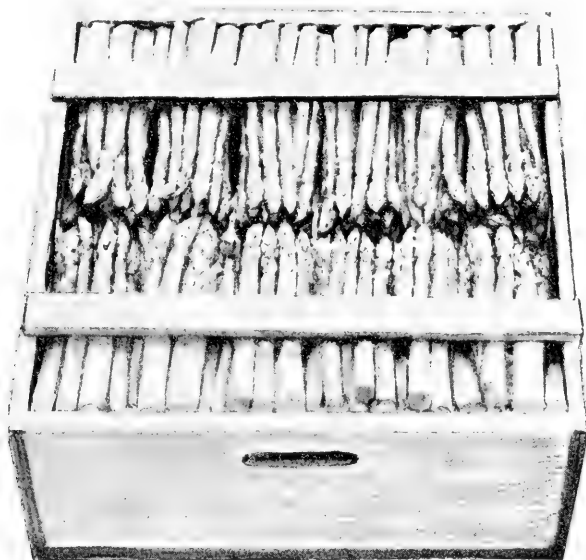


FIG. 32—BOX OF GIANT ASPARAGUS READY FOR SHIPMENT

In these the bunches are laid down flat, in tiers, alternating the butt ends so that when the crates are full the top row is level with the cover. Some growers, of very fine asparagus even, use solid wooden boxes. Fig. 32 shows such a box containing three dozen bunches. A crate with the top a few inches narrower

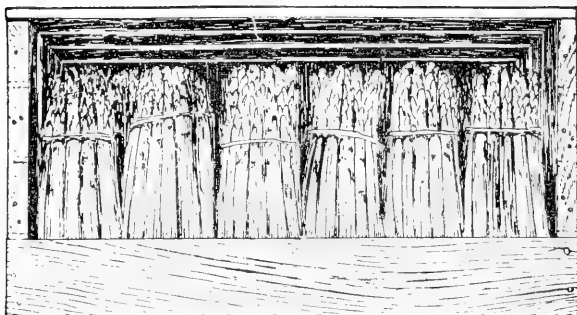


FIG. 33—SOUTHERN ASPARAGUS CRATE, CONTAINING 24 BUNCHES OF GREEN ASPARAGUS

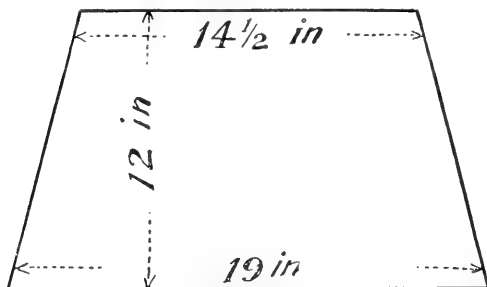


FIG. 34—END PIECE OF SOUTHERN CRATE

than the bottom has the advantage that it holds the bunches more firmly together than straight-sided boxes. Fig. 33 shows a crate containing two dozen bunches of green asparagus ready for shipment, with the exception of the slats to be nailed on the side. Fig. 34 shows the shape of the end pieces. These crates are made of various sizes, according to the

length of the bunches. The crate here illustrated was 24 inches long, 12 inches high, 19 inches wide at the bottom, and $14\frac{1}{2}$ inches at the top, inside measurement. The end boards were $\frac{7}{8}$ of an inch thick, and the slats about half an inch.

In shipping to a distant market some thoroughly wet grass, or sphagnum moss, should be put in the bottom of the crate, the bunches stood on ends, butt down, and pressed so tightly together that they can not move or shift in handling. The crate should have a tight bottom and ends. The sides may be tight half way up, and the rest of the sides and the top should be slatted. This keeps the butts moist and the tops dry and cool.

XII

FORCING



THE forcing of asparagus in various methods has been practiced for centuries, and is rapidly developing into an important industry. The forcing may be done in any place where a temperature of 50° to 60° can be secured, in the greenhouse, hot-bed, pit, cellar, or in the garden and field. Whichever plan is pursued, the management of the plants to be forced is the same. The roots should not be less than three years old, and, if obtainable, four or five-year-old plants are to be preferred. These may be dug up from ordinary out-of-door plantations, or, if the forcing is to be done on a large scale and as a permanent industry, the plants have to be grown from seed for this special purpose. To keep up a continuous succession new sowings have to be made every year. The sowing of the seed and the management of the plants during the first year is the same as described in Chapter V.

The following year, as early as the season permits, the one-year-old seedlings are planted out in rows, to develop as much strength as possible. As the plants are to remain only two years in the nursery bed, they may be placed closer than in a permanent plantation. A distance of two and one-half feet between the rows and one foot in the rows is, however, the narrowest limit, and,

where enough ground is available, three by one and one-half or two feet would be still better. By purchasing one-year-old plants a year's time may be gained, but otherwise there are decided advantages in raising one's own plants. During the following two seasons the ground has to be kept in the best possible tilth, and at the end of the third season from seed the roots may be dug just before the ground is likely to freeze. In lifting the roots it is important not to expose them to the drying influence of the sun and air more than is unavoidable. It is also important to preserve the entire clump intact with as much soil adhering to the roots and crown as possible. They are then placed in a shed, pit, or cool cellar, and covered with sand or soil to prevent their drying out. Moderate freezing does not injure the roots, and some growers think that it even adds to their forcing value.

FORCING IN THE GREENHOUSE

With florists the forcing of asparagus has this important advantage: that the income obtained from it is nearly all gain, as the space under the benches, which may thus be utilized, is of but little use for other purposes. If the floor under the benches is soil this is dug out so as to form a pit about a foot deep, or at least a few inches deeper than the clumps are high. Three or four inches of good rich soil is scattered over the bottom, and upon this the clumps are placed close together. Dry, mellow soil is then scattered between and over the clumps, so that the crowns are covered one or two inches, and given a thorough watering. If blanched shoots are desired, the crowns will have to be

covered with six or eight inches of soil. The same object may be obtained by shutting off the light, which can easily be accomplished under greenhouse benches. Where it is not practicable to make excavations under the benches, a pit may be constructed by placing boards against the posts and filling in the space thus furnished. To secure a succession, new roots from the reserve stock have to be planted every three or four weeks.

For the first week or ten days after placing the roots in the forcing-pit they should be kept rather cool, so as to give them a chance to become established. A temperature of 45° to 50° is best, at first. Afterward it should be raised to 55° to 60° , and during the day it may rise as high as 80° to 85° . But, as a rule, very high temperatures induce a spindling growth. During the entire forcing process asparagus requires a large amount of water, but unless it has the chill taken off, and ample means for drainage are provided, it may do far more harm than good. The interval between the time of planting and the first cutting varies greatly, according to the temperature and other conditions.

The following are actual dates of asparagus forcing under benches at Cornell University: Plants taken from an old patch November 29th and set under benches three days later. December 4th, shoots just pushing through. December 8th, first shoots cut, averaging nine inches long. December 14th, first good cutting, shoots running from six to fifteen inches long. December 18th, second good cutting. December 26th, a good cutting, some of the shoots having remained too long and become woody; some of these shoots were

two feet long. January 10th, a heavy cutting. January 19th, cut about half as many shoots as on the 10th. January 30th, cut about as much as on the 19th, but shoots growing smaller. February 10th, small cutting of weak shoots. Beyond this time there were no shoots worth cutting.

FORCING IN HOTBEDS AND FRAMES

The forcing of asparagus in hotbeds does not differ materially from that in the greenhouse, except in the supply of heat. "A most suitable place for forcing asparagus," writes William Scott, in *Garden and Forest*, "is a frame about four feet deep with one-fourth inch hot-water pipe running around it. About two and one-half feet of fresh stable litter should be put into the frame and firmly packed, with an inch or two of sand spread over it. This bed should be allowed to stand until the heat of the manure has declined to about 70° , and not below 65° , before the crowns are placed on it. For this work advantage should be taken of a day when the weather is mild, as the crowns are easily damaged by frost. Large crowns five or six years old are preferable to smaller ones for forcing. They may be placed rather closely together in the frame, but the distance apart must be regulated by their size. The roots should be spread evenly over the surface and covered with six inches of sand. Little water will be required, as the steam from the manure affords considerable moisture; but if the bed should become dry, it may be moistened with water of the same temperature as the soil in the frame. A little air may be admitted, when the day is bright and warm,

to keep the temperature from rising above 80°. When the points of the shoots begin to appear above the sand the crop is ready to cut. When ground is plentiful, a supply of forcing crowns can be kept up by sowing a little seed every year, having five or six successions, the oldest plants being forced for cutting."

With French gardeners it is customary to plunge the frames in warm stable manure and place the roots directly in the manure, packed as closely together as possible. A mere sprinkling of soil is placed over them. As a result the shoots come up very thick. Only strong, fine three-year-old roots are used, and as many as five crops of roots follow each other through the autumn, winter, and spring in the same frame. Straw mats are used to cover the frames at night.

FORCING IN THE FIELD

Forcing asparagus where it is grown in the field has a twofold advantage over removing the roots to a warm place. First, it saves the trouble and expense of transplanting them, which must be done with much care; and, second, it saves the plants from being ruined by the forcing process. Plants forced in the field where they grow will, if given good care, regain their vigor in a season or two, and may be used again for forcing. By this latter method a better quality and a larger quantity of marketable asparagus is also secured.

Various means have been devised to force asparagus in the field, where it is so well established that it continues growth in the summer as though it had not been forced the previous winter. A simple and rather

common method of accomplishing this is to place barrels over clumps of asparagus very early in the spring and pile fermenting manure about them, the warmth from the manure forcing the shoots into rapid growth. When the forcing season is over and the danger from frost is past the barrels are removed, and the plants continue growth in the open air. Sometimes asparagus is forced by placing frames, covered with sash, over the plants in the field, the rows of asparagus being set rather close together. This is considered a very profitable method by many market gardeners. Another method of forcing asparagus in the field is to dig ditches between the rows and fill them with fermenting manure. The surface of the bed may also be mulched with manure. The latter plan is extensively practiced by French market gardeners.

At the beginning of November the pathways between the beds of asparagus are dug up about two feet in depth and width. The soil coming from the pathway is divided very carefully and put about eight inches thick on the surface of the bed. The trench is filled up with fresh stable manure, not litter, and frames are placed on the bed. The manure should rise as high as the top of the frames and the lights be entirely covered with mats and litter to prevent the heat accumulating in the frame from escaping. In about two or three weeks the asparagus begins to show itself on the surface of the bed. Many market gardeners cover the whole of the bed inside the frames to a thickness of three or four inches with manure, to force the vegetation more quickly; but in this case the manure

must be removed when the asparagus begins to shoot. When the shoots are about three inches out of the ground they may be cut. The mats must be taken off in the daytime, but the heat must be well kept up, else the roots and buds will fail to push. The beds are forced every second year only. The gathering of the asparagus may continue for about two months but no longer, or the plantation would be injured. When the gathering is over the frames are taken away, and the soil which was dug up from the alleys is put back again.

An ingenious method of forcing asparagus in the field by means of shallow tunnels was devised and successfully carried out by Prof. J. C. Whitten, at the Missouri Experiment Station, who gives the following account in Bulletin No. 43 :

“ The field selected for the experiment was planted to asparagus about ten years ago. The plants were in fair vigor, though of a small variety. The first section forced embraced six rows, four feet apart, and fifty feet long. Fig. 35 shows this section with one tunnel uncovered. Trenches were first made between the rows. This was done by plowing between them, twice in a place, throwing the furrows on the plants so as to cover each row with two furrows of loose earth. These trenches between the rows were then made uniform by means of the spade. When finished they were three or four inches lower than the crowns of asparagus in the adjacent rows. These trenches were then covered with twelve-inch boards, which rested on four-inch blocks, placed at frequent intervals along either side of the trenches. This formed tun-



FIG. 35—TUNNEL THROUGH THE ROWS OF ASPARAGUS FOR FORCING STEAM THROUGH THE SOIL

nels between the rows for conducting the steam. To guard against the steam's escaping, two or three inches of soil was placed over the boards, and the asparagus patch was then covered with five or six inches of horse manure. This covering was to prevent the heat from escaping from the soil too rapidly. It was then ready for the steam to be turned into the tunnels.

"To conduct the steam a one and one-half inch pipe was carried above ground from the boiler to one end of the central tunnel, a distance of one hundred and eighty-five feet. A steam hose long enough to reach each tunnel was attached to this pipe through which to blow steam into the tunnels. It was not the idea to give a constant supply of steam, but to discharge a little into the tunnels each afternoon, or as often as was necessary to maintain sufficient warmth. A piece of tile was inserted into the mouth of each tunnel to prevent the discharging steam from tearing away the earth.

"The first steam was turned into the tunnels on November 14th. Steam was discharged into each tunnel, not to exceed five minutes at a time, in order not to heat the earth too hot in any single place. It required about one hour of steaming the first day to bring the bed up to the required temperature of sixty degrees. The distribution of heat throughout the bed was very uniform and satisfactory. The moist steam seemed to permeate the soil equally in all directions.

"After the first day very little steaming was necessary until the asparagus began to be produced. On

an average the bed was steamed about twice in three days and then only for about five minutes for each tunnel. The soil and horse manure mulch seemed to hold the heat very well, the frequent steamings keeping up fermentation in the mulch.

“The first asparagus was cut November 24th, ten days after the first steam was applied. The stems were cut just before they got through the soil and were perfectly bleached. They were as large as those ordinarily produced during the normal period of growth in spring, and were far more crisp and delicious.

“Cuttings of asparagus were made almost daily for about a month, when the growth became somewhat weak. The last cutting was made on December 22d. During the month 141 bunches of the ordinary market size, and weighing about one-half pound each, were cut from this bed of 25 x 50 feet. This was equivalent to 300 feet of row or 100 hills of asparagus.

“Exhausting steam into the asparagus bed, instead of returning it to the boiler in an inclosed circuit, would at first seem to be a wasteful process of heating. Experiment showed, however, that the circumstances justified this method. Heating a bed of this kind by a circuit of steam-pipes or hot-water pipes is very unsatisfactory. The heat from pipes very soon dries out the soil around the tunnels, destroying its power to conduct heat. In this way the bed becomes too hot and dry adjacent to the tunnels and too cold a short distance from them. It also becomes necessary to maintain heat in the pipes a good part of the time.

“By blowing steam directly into the tunnels the

soil is kept moist ; the steam has a penetrating effect, and permeates all parts of the bed, giving a uniform heat throughout ; this moist steam keeps up a continual fermentation of the manure mulch, thus giving heat, and only occasional brief steamings are necessary.

“ Care must be taken not to use too much steam at one time, or the plants may be ruined by overheating. Our asparagus rows were four feet apart, the tunnels midway between them were only eight inches wide, and yet we found that five minutes at a time was as long as was safe to force steam into a single tunnel.

“ These experiments have been so successful as to indicate that any one provided with a steam-heating plant could successfully force asparagus for the markets in this manner.”

Another plan of forcing asparagus in the field, devised by Prof. L. H. Bailey, is thus described in his “ Forcing Book ”: “ The Cornell asparagus house—if it may be called a house—is about twenty by fifty feet and the frame is made of steam-pipes. The sides, or walls, are only eighteen inches high, and the frame consists simply of a ridge and three pairs of rafters. The steam-heating pipe or riser is just beneath the ridge, and this feeds two returns upon either side of the house, next the walls. When it is desired to force the asparagus, canvas or muslin is stretched over the frames. No difficulty has been found in starting the asparagus into growth in January and February. The cover is left on and the heat kept up until all danger of frost is past, when the canvas is removed and the plants grow naturally out-of-doors. The secret of

this method will no doubt be found to lie in allowing the plantation to become very thoroughly established (at least, three or four years old) before forcing is attempted, in the very best tillage and fertilizing during the summer while the plants are growing, in taking off the cover just as soon as settled weather comes, and in not cutting the plants until after that time."

XIII

PRESERVING ASPARAGUS

CANNING



THE canning factory has made asparagus a vegetable for every day of the year instead of being a luxury for a few weeks, as was formerly the case. The canners have made it a farm crop instead of a garden product. To a great extent canning has transformed the farm into a garden, increasing the profits from every acre planted many fold. In many localities an acre of what was formerly considered a sandy waste is now yielding more than double the net profit of the best acre under cultivation in ordinary farm crops.

Eastern methods.—The pioneers in this industry on Long Island, N. Y., have been the Messrs. Hudson & Sons, who have extensive plants at Mattituck and Riverhead, each of them as complete as mechanical skill and enterprise can make them. Each plant consists of a storehouse, 50 x 150 feet; a packing-house, 40 x 125 feet; and a can manufactory, 25 x 60 feet. A steam-engine of ten horse-power is required for hoisting, pumping, and for generating gas for the soldering-heaters, and a boiler of one hundred horse-power to generate steam for sterilizing the asparagus. A perspective view of one of the plants is seen in Fig. 36.

The asparagus, as it comes from the growers, is in bunches seven and one-half inches long and weighing

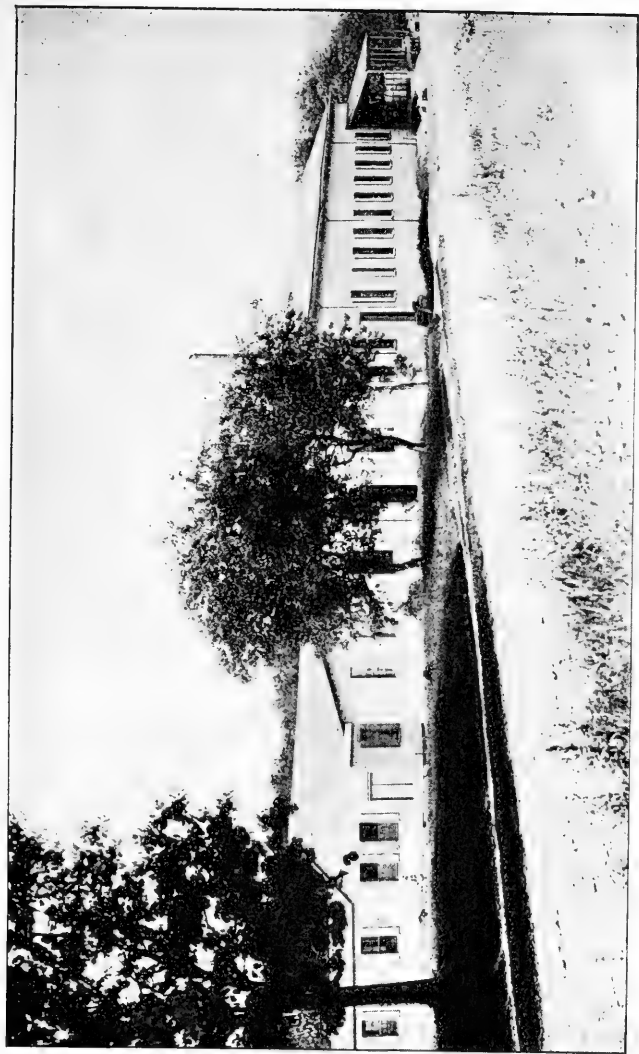


FIG. 36—PERSPECTIVE VIEW OF A LONG ISLAND ASTARAGUS CANNERY

two and one-half pounds each. These bunches are put under a cutter and cut to six and five-eighths inches; they are then untied and put in a tank four feet wide by eight feet long and two feet deep, in which they are washed as carefully as it is possible to do it. It is then hoisted up to what is called the blanching tank, which contains forty gallons. In this it is kept at a scalding heat for one-half hour, when it is ready for the cans. These are filled by women who soon become very dextrous, which is always the case when the pay is in proportion to the amount of work done. Each can contains just one and one-half pounds. Exact weight is imperative, as are details in all manufacturing establishments. Great care is exercised in packing, so that there are no bruised or broken heads, and that on opening the can the stalks may appear as well as if cut fresh from the garden. After the asparagus is in the cans they are filled with a weak brine, which not only expels the air, but adds materially to the flavor of the asparagus.

The cans are then taken to the soldering-bench for sealing up. There systematic labor is noticeable, as every detail of canning must be carried on systematically to make it profitable. The soldering-irons used are hollow and the exact size of the caps, which fit perfectly the grooves made for them. A single turn of the iron finishes the work. Before the caps are put in their places a small hole is made in each to allow the gas, which is generated by the heat from the soldering, to escape. Without this precaution it would be impossible to hermetically seal the cans. A single drop of solder closes the small opening, and the cans are ready for the retorts for sterilizing.

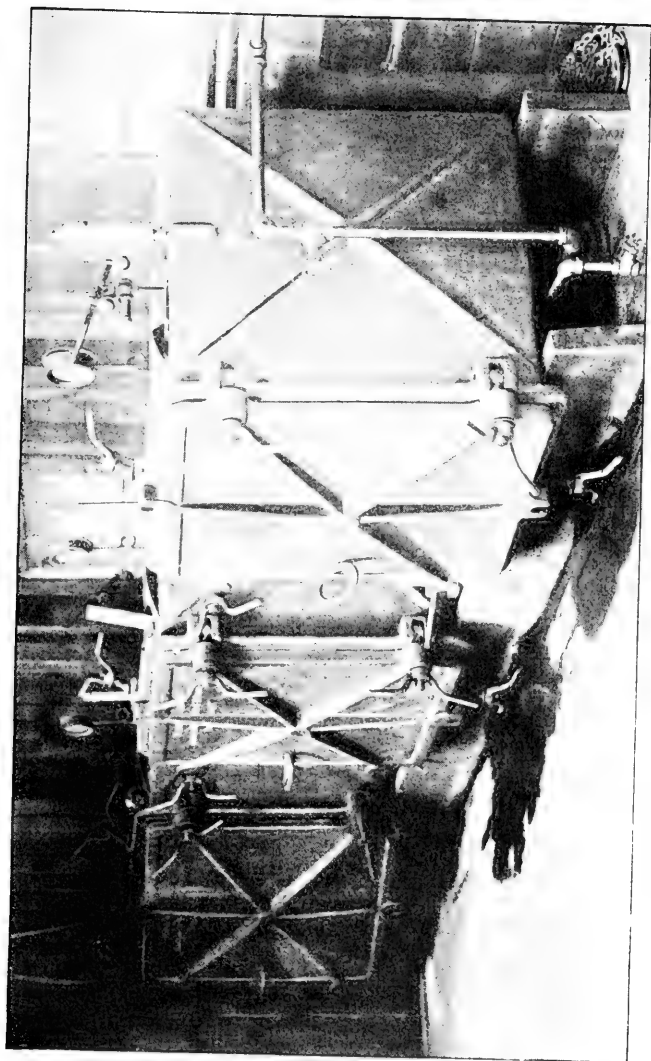


FIG. 37—STERILIZING TANK

Here two methods are employed—dry steam, which is the quicker method, and boiling in a closed tank. Most of the first-class stock is sterilized in the latter. This tank (Fig. 37) is in three sections, in all twenty feet long, each section holding five hundred cans. The cans are put in iron cribs and are pushed in and taken out with steam elevators. As soon as the cans are lowered the sections are closed tightly and the steam is turned on. The first process of sterilization lasts twenty minutes, when the tank is opened, the cans taken out, and a vent given each. This permits the accumulated gas to escape, which, if allowed to remain, would materially injure the quality of the asparagus, both in flavor and preservation. For this work a small prick punch is used, which makes a hole not larger than a pin's head. This vent is almost immediately closed with a single drop of solder and the cans are again returned to the tanks, where the same operation of cooking is repeated. Another twenty minutes completes the work, when the cans are removed to the packing-room, where they are labeled, wrapped, and packed ready for shipment. The cans or boxes are seven inches long, four wide, and two and one-half deep. A view of the sterilizing-room is presented in Fig. 38.

The culls, which are put up as tips, are small-sized and crooked heads which, although of equal value as a vegetable, are not shipped to market, as they would detract from the value of the first quality, and are considered by both farmers and canners as by-products. These are cut to three and one-half inches in length, and then go through the same process in canning as

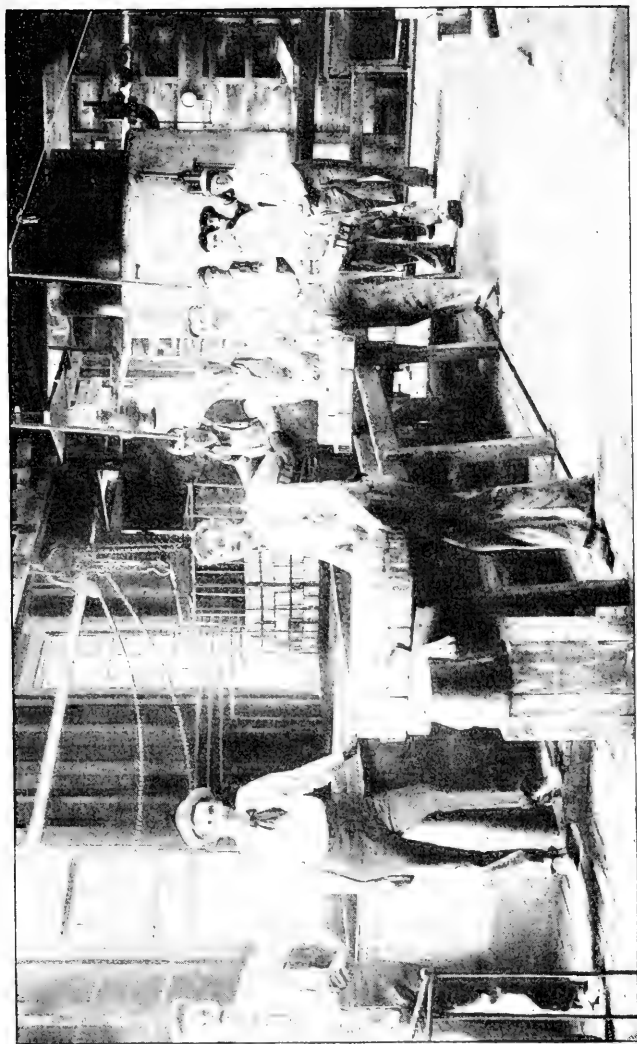


FIG. 38—VIEW OF STERILIZING-ROOM

the first quality, except that dry steam only is used in sterilization. After going through the blanching process the tips are put in round cans, four inches in diameter and five inches high. After soldering up these cans they are put in the retorts, which are three feet square, each containing five hundred cans, and treated with steam two hundred and fifty pounds to the inch. The cans remain in these retorts half an hour. Then they are taken out, vented, put back again, and remain under the same pressure another half hour, when the work is completed.

By rigid economy even in the most minute detail, and by the skill required in the knowledge of canning, asparagus can now be had at a reasonable price at all seasons of the year, which is a boon to both producer and consumer. At \$14.00 per one hundred bunches for No. 1 and \$7.00 per hundred bunches for No. 2, or culls, asparagus is one of the most profitable of agricultural crops, and even at one-half these prices it is a much better paying crop than potatoes at 50 cents per bushel.

Pacific Coast methods.—Canning and preserving of asparagus in California is carried on on as grand a scale as are most other undertakings. An idea of the extent and importance of this comparatively new industry may readily be conceived when it is considered that one establishment alone, The Hickmott Asparagus Canning Co., on Bouldin Island, in the San Joaquin River, has recently shipped an entire train-load of canned asparagus from San Francisco to New York. This train consisted of fifteen freight-cars containing 600 cases each, making a total of 9,000 cases, averag-



FIG. 39—INTERIOR VIEW OF A CALIFORNIA ASPARAGUS CANNERY

ing forty-eight pounds each, thus making an actual weight of 432,000 pounds. By far the larger portion of the yearly asparagus crop in California is canned or preserved in glass, and in that shape sent to the East, exported to England and the continent of Europe, and, in fact, to every civilized country of the world. For canneries where nothing but the white product is put up the shoots are cut the instant they show their tips above the surface. The canneries are located as near the fields as possible, the effort being to get the product in glass or cans before it becomes in any way withered, the important point being that asparagus is never allowed to become dried.

The method employed at Bouldin Island, where a crop of 1,500 acres is canned annually, is to have troughs containing running water in shady places in the fields. The asparagus, as fast as cut, is brought to these troughs, and is thoroughly washed. These troughs are just wide enough to take in the shoots of the proper length for canning, and each piece is trimmed before being immersed. From the troughs the asparagus is taken to the sorting table, then on to the scalding vats until it reaches the fillers, where is completed the systematic handling of this product, packing it to perfection, nothing remaining except to be labeled, when it is ready to be forwarded to the markets of the world. The entire process from the time the stalks are taken from the ground to the time they are ready for the table consumes less than six hours. The process throughout is a marvel of cleanliness, particular attention and stress being laid on every detail connected with it. No bleaching agents or anything foreign or



FIG. 40—PERSPECTIVE VIEW OF CANNING PLANTS AT BOULDIN ISLAND

deleterious whatever is used in the packing of this plant. In Fig. 39 is seen the interior of one of these canneries, where the especially constructed solderless cans of the company are being packed. Everything connected with the growing, harvesting, and canning is done on Bouldin Island, save only the printing of the labels. That the operators may be lodged in comfort the company has erected modern cottages for their employes who have families, besides well-equipped boarding-houses. The development and growth of this asparagus cannery is one of the marvels of California. Starting ten years ago with a rented boiler, under the arched dome of the sky for a roof, and nothing but the shade of weeping willows for a storehouse, as seen in the Frontispiece, it has developed into a superb plant, equipped with all modern appliances. During the active season 1,500 hands are employed directly and indirectly by the canning company, and the estimated output for the average season is 150,000 cases. Figs. 40 and 41 present perspective views of some of the asparagus canneries on Bouldin Island.

DRYING

Although the drying of asparagus is not much practiced in America, it is well worth the attention of those who at times have a surplus of fresh stalks. Dried asparagus is especially recommended for soups and sauces, and if properly prepared it is no less desirable as a table vegetable. Dried asparagus keeps indefinitely, and cost of transportation is largely reduced. For the latter purpose medium-sized spears are most suitable, as they dry more evenly than larger



FIG. 41—CANNERY IN ASPARAGUS FIELDS

ones. Some recommend the peeling or scalding of the stalks before drying, but this is not essential, and, if desired, may be done after steaming. On a large scale the drying may be done in any modern evaporator.

For home use the most satisfactory way is to string the stalks with a large needle and strong thread through the butt ends of the stalks, and hang them along buildings or fences where they are exposed to the full rays of the sun. To insure a uniform drying it is important that all the spears on the string are of the same thickness, as the thicker ones require more time to dry than those of smaller size. When the air is dry and warm one day's exposure to the sun will be sufficient to dry them. Otherwise the strings will have to be hung up in the kitchen in the evening, or in some other dry place over night, to be brought out again the following morning, until the asparagus is perfectly dry. It is then ready to be put in boxes or loose bags and stored in a dry place. If the stalks have been peeled before drying, when desired for use they are placed in cold water for half an hour, some salt is added, and they are cooked like fresh asparagus.

For preparing dried asparagus that has not been peeled before drying, Dr. Brinckmeier recommends taking a sufficient number of the dried stalks and place them in water, which, while not boiling, is very near the boiling point, and keeping them there until they resume their succulent, smooth, fresh appearance. To keep the water just right a double boiler is best, with the stalks in the inner one. The water in the outer vessel should be kept at a steady boil. As the stalks

resume the fresh appearance, take them out carefully one by one and place in cold water until cooled, after which place on a dish to dry. They should be carefully scalded to remove the hard outside skin, done up in a bundle, either by tying with strings or wrapping in a piece of netting, placed in boiling water, to which a little salt has been added, and allowed to remain there a few moments—a very few, for it cooks quickly—until done.

These methods are recommended for white asparagus only, and when properly dried and cooked asparagus so treated is by many considered to be hardly distinguishable from the freshly cut, although it loses its white color in the process. Smaller and green stalks may be dried on wire frames or wooden racks over the kitchen stove, similar to apples.

XIV

INJURIOUS INSECTS



WHILE a number of different insects feed upon the asparagus plant, there are only two species which have so far become extensively distributed and caused serious damage in the United States. Both of these were imported from Europe, and are limited for their food supply to the asparagus plant.

THE COMMON ASPARAGUS BEETLE*

(*Crioceris asparagi*)

This beetle is by far the most important enemy of the asparagus plant. It was first noticed in this country at Astoria, L. I., now a part of New York City, in 1859, but its actual introduction into that locality occurred about 1856. The injury inflicted by this insect is due to the work of both adults and larvæ upon the tender shoots, which they render unfit for market, early in the season. Later they destroy, by defoliation, growing plants, and are particularly injurious to seedlings, the roots of which are weakened by having their tops devoured. Larvæ, as well as beetles, attack the tenderest portions of the plants, but the latter gnaw with seemingly equal relish the epidermis, or rind, of the stems. The beetles are also

* Condensed from an official report by J. H. Chittenden of the United States Department of Agriculture.

accused of gnawing young shoots beneath the surface, causing them to become woody and crooked in growth.

The beetle illustrated in Fig. 42 is a most beautiful creature—from the entomologist's point of view—slender and graceful in form, blue-black in color, with red thorax and lemon-yellow and dark blue elytra or

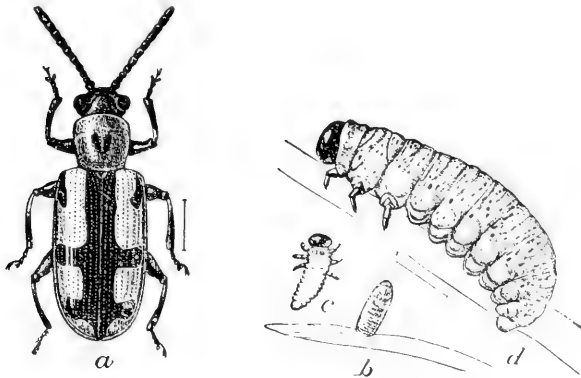


FIG. 42—COMMON ASPARAGUS BEETLE

a, beetle; *b*, egg; *c*, newly hatched larva; *d*, full-grown larva

wing covers, with reddish border. Its length is a trifle less than one-fourth of an inch.

From the scene of its first colonization in Queen's County, N. Y., the insect migrated to the other truck-growing portions of Long Island. It soon reached southern Connecticut, and has now extended its range northward through Massachusetts to New Hampshire. Southward it has traveled through New Jersey, where it was first noticed in 1868, to southern Virginia. At present it is well established in the principal asparagus-growing sections of New England, of New Jersey,

Delaware, and Maryland, and is present in Pennsylvania, New York, and Ohio. The question of distribution is an important one, as this species is rapidly extending its range. In a very few years we may expect its spread to other portions of the States in which it is now local, and later it will naturally move westward to Indiana and other States west and south of there.

The insect passes the winter in the beetle state under convenient shelter, and toward the end of April or early in May, according to locality, or at the season for cutting the asparagus for market, issues from its hibernating quarters and lays its eggs for the first brood. The eggs are deposited endwise upon the stem or foliage, and in the early spring upon the developed stalks, usually in rows of from two to six, or more. In from three to eight days the eggs hatch, the young larvæ, commonly called "grubs" or "worms," presenting the appearance indicated in Fig. 42, *c*. They at once begin to feed, and are from ten days to a fortnight, according to Fitch and others, in attaining full growth. When full grown the larva appears as in Fig. 42, *d*. It is soft and fleshy, much wrinkled, and in color dark gray or olive, which usually becomes lighter and yellowish with age. The mature larva enters the earth, and here, within a little rounded, dirt-covered cocoon which it forms, the pupa state is assumed. In from five to eight or more days the adult beetle is produced, which soon issues from the ground in search of food and of a suitable place for the continuance of the species. In Fig. 43 is shown a spray of asparagus, with the common asparagus beetle

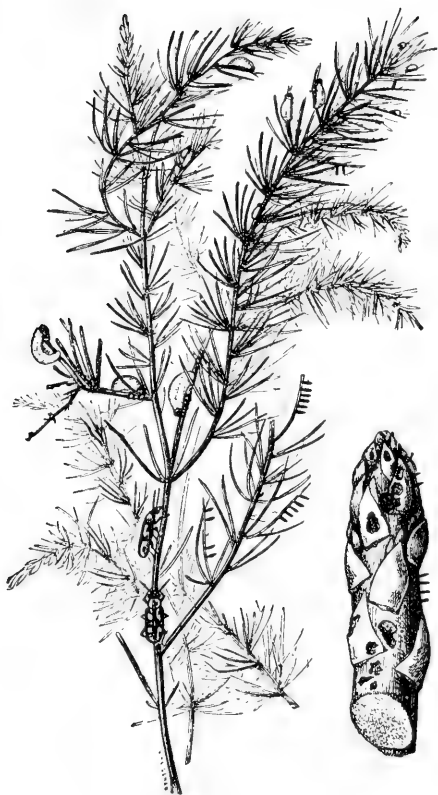


FIG. 43—SPRAY AND TOP OF ASPARAGUS ATTACKED BY
BEETLES

in its different stages, asparagus top at the right showing eggs and injury.

The duration of the life cycle is about thirty days from the time the eggs are laid until the insects attain maturity, but the time is shorter in the hotter parts of a season than in the cooler days of May or September. In the District of Columbia the eggs, in the warmest part of midsummer, develop in three days and the pupæ in five days. From this it may be estimated that, in the very warmest weather, the development of the insect may be effected in about three weeks from the time the egg is laid. In colder climates and in spring and autumn the development from egg to beetle will require from four to perhaps seven weeks. In the northern range of the species, two and perhaps three broods are usually produced, and farther southward there is a possibility of at least a fourth generation. In the latitude of the District of Columbia the beetles usually disappear to enter into hibernation in the latter days of September.

The common asparagus beetle has very efficient checks in the shape of predaceous insects, which prey upon its larvæ and assist in preventing its undue increase. One of the most active of these predaceous insects is the spotted ladybird (*Megilla maculata* DeG.), represented in its several stages in the illustration (Fig. 44.) The adult of this beetle is rose-colored, with numerous black spots. The spined soldier-bug (*Podisus spinosus* Dal.) and the bordered soldier-bug (*Stiretrus anchorado* Fab.) are also useful as destroyers of asparagus beetle larvæ, which they catch and kill by impaling them upon their long beaks and sucking out

their juices. Certain species of wasps and small dragon-flies also prey upon the larvæ. Asparagus beetles are very susceptible to sudden changes of temperature, and immense numbers of hibernating beetles are sometimes killed in winter during severe cold spells following "open" weather.

Remedies.—The common asparagus beetle, under ordinary circumstances, may be held in restraint by

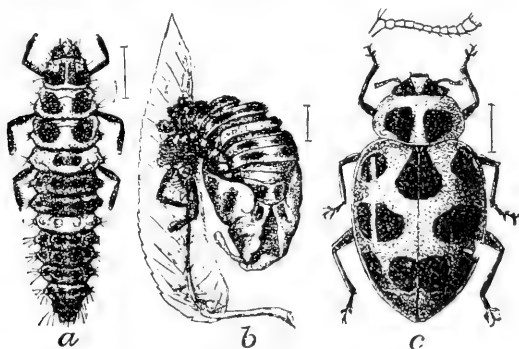


FIG. 44—SPOTTED LADYBIRD

a, larva; *b*, empty pupal skin; *c*, beetle, with enlarged antenna above

the simplest means. Chickens and ducks are efficient destroyers of the insect, and their services are often brought into requisition for this purpose. A practice that is in high favor among prominent asparagus growers is to cut down all plants, including volunteer growth, in early spring to force the beetles to deposit their eggs upon new shoots, which are then cut every day before the eggs have time to hatch. Another measure of value consists in permitting a portion of the shoots to grow and serve as lures for the beetles. Here

they may be killed with insecticides, or the plants, after they become covered with eggs, may be cut down and burned, and other shoots be allowed to grow up as decoys. One of the best and least expensive remedies against the larvæ is fresh air-slacked lime dusted on the plants in the early morning while the dew is on. It quickly destroys all the grubs with which it comes in contact. The lime may be conveniently applied by means of a whisk-broom or a Paris green sifter. Even dry road dust applied in this manner will have a beneficial effect. The special merit of these insecticides is that they can be used without the least danger upon young shoots being cut for market or home use.

Paris green and other arsenites, applied dry in powder, mixed with flour or plaster, or in solution, answer equally well, after cutting has ceased, and possess the advantage of destroying beetles as well as larvæ. One pound of Paris green to a barrel of fine plaster makes a sufficiently strong mixture. It may be necessary to make two of these applications at intervals or as often as the larvæ reappear on the plants. Powdered hellebore mixed with flour, one part to ten, or in solution of one ounce of hellebore to three gallons of water, is also very effective against the young larvæ. Pyrethrum or buhach may be used in similar manner, and kerosene emulsion has been highly recommended by some experimenters. In hot weather, when the soil is dry, the larvæ may be brushed or shaken from the plants so that they will drop to the heated ground, where they die, being unable to regain the shelter of the plants. Whichever methods for the destruction of this pest are adopted, unless the work be done thor-

oughly and with concerted action by all the growers in the section, the relief can not be permanent.

THE TWELVE-SPOTTED ASPARAGUS BEETLE

(*Crioceris 12-punctata* Linn)

The presence of this insect in America was first detected in 1881, and it is still much rarer and consequently less injurious than the preceding species. In Europe, where it is apparently native, it is common but not especially destructive. The chief source of damage from this species is from the work of the hibernated beetles in early spring upon the young and edible asparagus shoots. Later beetles as well as larvae appear to feed exclusively upon the berries. The eggs are deposited singly, and apparently by preference, upon old plants toward the end of shoots, which, lower down, bear ripening berries, and they are attached along their sides instead of at one end, as in the case with the eggs of the common species. Soon after the larva hatches from the egg it finds its way to an asparagus berry, enters it, and feeds upon the pulp. In due time it leaves the first berry for another one, and when full growth is attained it deserts its last larval habitation and enters the earth, where it transforms to pupa and afterward to the adult beetle. The life cycle does not differ materially from that of the common species, and there are probably the same or nearly as many generations developed.

This species is at present distributed throughout the asparagus-growing country of New Jersey, particularly in the vicinity of the Delaware River, the whole

of Delaware, nearly the entire state of Maryland, the District of Columbia, the southeastern portion of Pennsylvania bordering the state line of New Jersey, northeastern Virginia in the vicinity of the western shore of the Potomac River, Staten Island, and Monroe County, N. Y., the last mentioned being the most northern locality known for the species. The mature beetle in life rivals the common asparagus beetle in

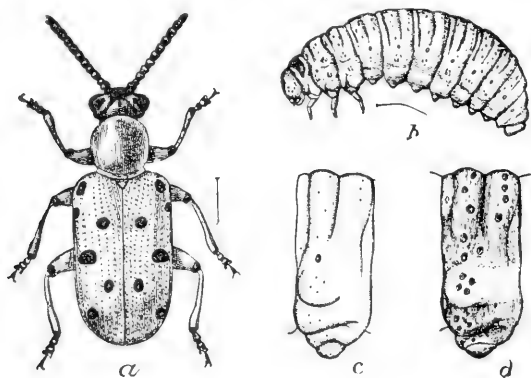


FIG. 45—TWELVE-SPOTTED ASPARAGUS BEETLE

a, beetle; *b*, larva; *c*, second abdominal segment of larva; *d*, same of common asparagus beetle

beauty, but may be distinguished by its much broader wing covers and its color. The ground color is orange red, each wing cover is marked with six black dots, and the knees and a portion of the under surface of the thorax are also marked with black, as seen in Fig. 45, *a*. The beetle as it appears on the plant when in fruit very closely resembles, at a little distance, a ripe asparagus berry. The full-grown larva is shown

in Fig. 45, *b*. It measures, when extended, three-tenths of an inch, being of about the same proportions as the larva of the common species, but is readily separable by its ochraceous orange color. Fig. 45, *c*, shows the second abdominal segment of larva, and *d* same of the common asparagus beetle, much enlarged.

Remedies.—The remedies are those indicated for the common asparagus beetle, with the possible exception of caustic lime and other measures that are directed solely against that species, but the habit of the larva of living within the berry places it for that period beyond the reach of insecticides. The collection and destruction of the asparagus berries before ripening might be a solution of the problem, but it is questionable if recourse to this measure would be necessary, save in cases of an exceptional abundance of the insect.

THE ASPARAGUS MINER

(*Agromyza simplex*)

In a recent bulletin from the New York Experiment Station, Prof. F. A. Sirrine describes a comparatively new and injurious insect on asparagus. It was discovered on Long Island, and injures the young plants by mining just underneath the outside surface. The habits of this creature are such that there is little chance of applying remedies for its destruction. Cultural and preventive measures seem to be the most practical, and are suggested. The parent insect is a small fly, which deposits its eggs for the first brood early in June, and no doubt much can be done toward keeping the pest under control by not allowing small shoots to grow during the cutting season. Professor

Sirrinc is of the opinion that where young beds are put out yearly the pest can be kept in check by pulling and burning the old stalks. He points out the fact that the stalk sh^{ld} be pulled in the fall rather than in the spring, as it is difficult to pull them early in the season, and in many cases the dormant stage of the insect is left in the ground.

XV

FUNGUS DISEASES



SPARAGUS is subject to the attacks of a number of fungi, the most widespread and destructive being the "rust," the cause of which is a fungus described by De Candolle as *Puccinia asparagi* in the year 1805. From this it is seen that the rust upon the asparagus has been known to scientists for nearly a hundred years, and it is but reasonable to suppose that more or less of this fungus has existed beyond the history of man.

The first mention of asparagus rust in the United States was by Dr. Harkness, who claimed to have observed it on the Pacific Coast in 1880, although it is doubtful whether the genuine asparagus rust was ever found there. The first mention of it in the Eastern States was in the fall of 1896, and since then its range has been widening each year. Dr. Byron D. Halsted, of the New Jersey Experiment Station, was the first to call attention to it, and made it the subject of careful study. The results and conclusions derived from his experiments were published in a special bulletin, and from this the greater part of the following has been condensed.

RECOGNITION OF THE RUST

When an asparagus field is badly infested with the rust the general appearance is that of an unusually

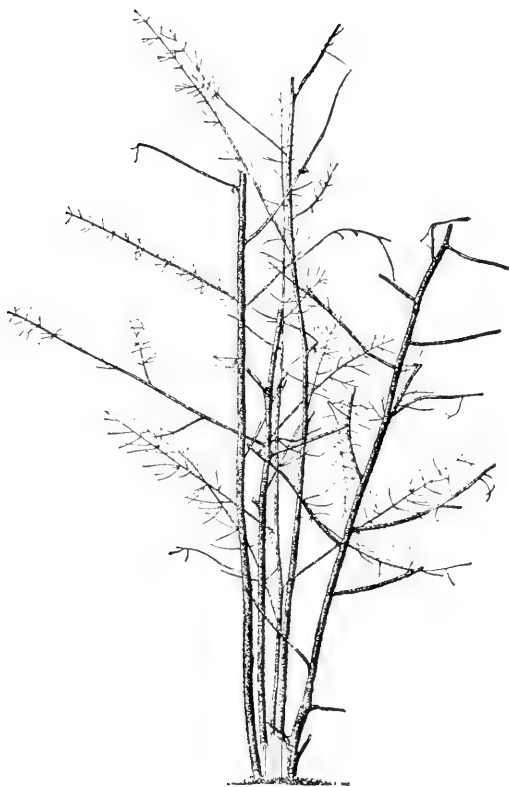


FIG. 46—ASPARAGUS STEMS AFFECTED WITH RUST

early maturing of the plants (Fig. 46). Instead of the healthy green color there is a brown hue, as if insects had sapped the plants or frost destroyed their vitality. Rusted plants, when viewed closely, are found to have the skin of the stems lifted, as if blis-

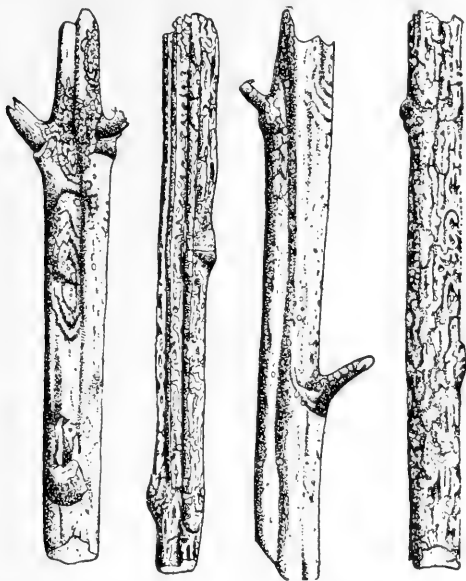


FIG. 47—PORTION OF RUSTED ASPARAGUS STEMS

tered, and within the ruptures of the epidermis the color is brown, as shown in Fig. 47. The brown color is due to multitudes of spores borne upon the tips of fine threads of the fungus, which aggregate at certain points and cause the spots. The threads from which the spores are produced are exceedingly small and grow through the substance of the asparagus stem,

taking up nourishment and causing an enfeebled condition of the victim, which results in loss of the green color and the final rustiness of the plant, due to the multitude of spores formed upon the surface. These spores are carried by the wind to other plants, where new disease spots are produced; but as the autumn advances a final form of spore appears in the ruptures that is quite different in shape and color from the first ones produced through the summer. The spores of late autumn, from their dark color, give an almost black appearance to the spots.

There is another form which the rust fungus assumes not usually seen in the asparagus field, but may be found in early spring upon plants that are not subjected to cutting. This is the cluster-cup stage, so named because the fungus produces minute cups from the asparagus stem, and in small groups of a dozen to fifty, making usually an oval spot easily seen with the naked eye. This stage of the fungus comes first in the order of time in the series, and is met with upon volunteer plants that may grow along the roadside or fence row, or in a field where all the old asparagus plants have not been destroyed.

METHODS OF TREATING THE RUST

All the cultivated varieties of asparagus are readily affected by the rust, although it has been found that some varieties, notably Palmetto, are less susceptible to its attacks than others. The most effectual means of controlling the disease are spraying, burning of the brush, cultivation, and irrigation.

Spraying.—Dr. Halsted, in his first experiments,

used soda-bordeaux, hydrate-bordeaux, and potash-bordeaux. The spraying began June 2d, and ten sprayings were applied during the season. The applications were made with a knapsack pump, and therefore were far more expensive than they would have been if the sprayings were made with horse-power. With the fungicide costing \$5.00 per acre, and a machine that would spray two or more rows at a time, it would be possible to reduce the cost to \$10.00 per acre, or even less. In effectiveness the soda-bordeaux stood first. Between the other fungicides there was but little difference. The best results showed a reduction of rust of about one-quarter, which is not as satisfactory a result as had been expected.

In the spraying work conducted by Professors G. E. Stone and R. E. Smith, at the Massachusetts Experiment Station, the results were more encouraging. The solutions used were potassium sulfid, saccharate of lime, and bordeaux mixture. The spraying was done with a knapsack sprayer, provided with a Vermorel nozzle, and after the first application it became evident that the practice was of little importance on account of the difficulty in making the solution stick to the plant. For successful spraying of asparagus a finer nozzle is required than any that is now in the market.

In some other experiments carried out on a small scale the asparagus plants were practically covered with solutions, when they were put on with an ordinary cylinder atomizer, and the lime solutions showed excellent sticking qualities; but with the ordinary coarse nozzle the solutions would run off of the glossy

epidermal covering of the plant very readily. Should the spraying of asparagus ever become a necessity, then some apparatus which can be strapped to a horse's back should be used. The narrow space between the rows forbids the use of the ordinary mounted appliances, and if spraying is to be carried on upon a large scale, it would be better to have the spraying mixture carried in some manner on the horse's back. In this way it would be possible to carry some thirty or forty gallons of mixture through the narrow rows.

Burning the affected tops.—There can be no doubt that by the burning of the infested brush, after the cutting season, innumerable rust spores are destroyed. But if this is done before the stalks are entirely dead new ones will spring up at once, and in a few days will be as badly affected as the first. The burning of the tops in the summer has, moreover, a decidedly injurious effect upon the roots, seriously weakening their vitality, and making the growth of the following year still more susceptible to the infection.

In the autumn, however, after the stalks are dead and dry, this damage does not prevail, and the spores upon old brush can be destroyed by burning the asparagus stems either as they stand in the field or by cutting and throwing the brush into piles. By the latter method many of the smaller branches will be broken off and scattered upon the ground, giving a suitable place for the spores to remain over the winter. For the same reason it is an advantage to burn the brush in autumn instead of the spring, and thus prevent the large loss of spores that would obtain. In other

words, burn the plants as soon as they become brown and lifeless, for any delay means the breaking up of the brittle, rusty plants, and a heavy sowing of the spores upon the ground. If the fire could go over the whole field of standing brush, that would be the most effective destruction. At best, with these precautions, many of the spores will get scattered upon the soil, and it would be well to sprinkle a thin coat of lime upon the ground and leave it there during the winter. If this could be followed by a turning under of the surface soil in the spring, it would bury the spores that might still be living, so that they would be out of reach.

Cultivation and irrigation.—It has been observed that the injury to asparagus plants, as a result of rust, has been confined to dry soils, although there are places where beds in close proximity showed remarkable differences as to infection; and that robust and vigorous plants, even where cultivated on apparently dry soil, are capable of resisting the summer or injurious stage of the rust.

In view of all the experiments so far made, and the experiences of practical asparagus growers, Stone and Smith conclude that : “ The best means of controlling the rust is by thorough cultivation in order to secure vigorous plants, and in seasons of extreme dryness plants growing on very dry soil with little water-retaining properties should, if possible, receive irrigation.”

From a knowledge of the occurrences of the rust in Europe, and from observations made in Massachusetts, they are led to believe that the outbreak of the

asparagus rust is of a sporadic nature, and is not likely to cause much harm in the future, provided attention is given to the production of vigorous plants.

ASPARAGUS LEOPARD SPOT

Attention was called to this new disease by Prof. W. G. Johnson, in Bulletin No. 50, Maryland Experiment Station, September, 1897. It was observed in a limited area in the asparagus growing section on the eastern shore of Maryland. The disease belongs to the group of anthracnoses, and is regarded by Dr. B. D. Halsted as a new species. In some places growers have mistaken it for the work of asparagus beetles. In general appearance it is very striking, the characteristic spots resembling the coat of the leopard. It has, therefore, been called "asparagus leopard spot," to distinguish it readily from rust. The disease has been found only in a comparatively small area, but, no doubt will be found in other places later. Asparagus growers should, therefore, be on their guard and watch it. The remedies thus far successfully used are the same as those for rust.

XVI

ASPARAGUS CULTURE IN DIFFERENT LOCALITIES

ASPARAGUS IN NEW ENGLAND



ASPARAGUS was grown in Concord, Mass., in a limited way as early as 1825. Mr. Edmund Hosmer used to carry it to market in season on his milk wagon. Timothy Prescott and F. R. Gourgas grew garden patches before 1840. To John B. Moore belongs the credit of growing and improving asparagus in this section of the State. Mr. Moore selected the most promising shoots, and by a judicious system of culture succeeded in placing on the market a valuable variety in the shape of Moore's Cross-bred. Most of the "giant" asparagus grown in Concord to-day could be traced to the plants produced by his skill. A sample bunch of twelve stalks, twelve inches long, from Moore's Cross-bred plants weighed four pounds eight ounces. In 1872 the first bed of asparagus of any size was set out by Mr. George D. Hubbard, who was laughed at by his neighbor farmers, who saw only ruin for the young man. The next year Mr. Hubbard set out more, so that for twenty years he was probably the largest grower in Massachusetts.

Most of the leading varieties are grown in Concord, but the farmers are looking for a rust-proof variety and

hope to find one. The Palmetto has not rusted as badly as other kinds, but has not been grown so extensively. One-year-old roots should be set by all means, as they start sooner, grow more vigorously, and in the end pay better. The roots should be carefully selected from vigorous stock. A very large part of Concord asparagus is planted on sandy soil—*i.e.*, good, rich, mellow corn land. This kind of land needs more manure, but then the crop is more satisfactory and the labor bill is not so high. The land previous to setting to asparagus should be well tilled and manured.

Land for asparagus beds should be plowed late in the fall, and if stable manure can be afforded should be applied liberally. In the spring plow again early and harrow well. The roots should be planted in April as soon as the ground can be worked. After determining the direction of the rows a number of laths, four feet long, are placed in line where the first row is to be. It is very important to get the rows straight and an even distance apart. A good strong pair of horses and a large plow are used, a board being so placed above the mold-board of the plow that the loose soil will not fall back into the furrow. Drive the horses so that the middle of the evener will just come to the lath, then change the lath over its own length, if the rows are to be four feet apart, and that will mark the next row. Change each lath as you come to it, and when your first furrow is completed your second row will be all marked out. Return in the first row to make it deeper and also to straighten any bends. Shovel out the ends for a few feet and you will have a proper furrow to set

asparagus roots in. Proceed with the other rows in the same manner, and you will have a good-looking plantation.

The larger growers in Concord set the plants two feet apart in the row and have the rows four feet apart. The plants are set in the bottom of the furrow, covered two inches, and should level up by fall so that the crowns will be six or seven inches below the surface. The furrows may be made very deep, so that manure can be placed in the bottom, or fertilizer may be strewn before the plants are set or after. The roots should be spread out carefully in the bottom of the furrow, care being taken to have them in line. The bed should be cultivated with a fine-tooth cultivator or weeder often enough to prevent the growth of weeds. Keep the bed clean and do not have the trenches filled in before the last of September. The tops should not be cut in the fall of the first year, as the snow will be held by them, and thereby protect the roots to some extent. Some growers spread coarse manure on their beds in the fall to prevent the soil from being blown away and also to prevent winter killing, which, however, is rare.

In the second year the bed may be plowed or wheel-harrowed in the spring as early as possible. Concord growers use animal manure or chemical fertilizers, as the case may be or as the bed may require. The bed should be smooth harrowed just before the new shoots appear, and good clean cultivation given during the season. After harrowing or plowing in the third year, sow your chemicals or fertilizer broadcast and harrow in. A good formula for asparagus is : Nitrate of soda, 300 to 400 pounds; muriate of potash,

400 pounds; and fine ground bone, 600 pounds per acre. The shoots will appear about May 5th, and should be cut for about two weeks; then let them grow up and cultivate well during the season.

Home-mixing of fertilizer is practiced by some of the growers in this vicinity, as it is cheaper and better. Any intelligent farmer can, with a little study, purchase and mix the raw materials to advantage. Not so much fertilizer is used as formerly by our growers, who are beginning to think that we use more plant food than the crop needs, thus throwing away many dollars each year. The cost of an acre of asparagus when properly planted and manured is about two hundred dollars, varying with the cost of help, manure, etc. The average product of asparagus beds is about two hundred and eighty-eight dozen bunches per acre—probably less since the rust appeared in 1897.

Asparagus is grown largely on Cape Cod. There the roots are planted in rows six feet apart and four or five feet in the row. Seaweed is used largely in connection with fertilizer and manure. Various grains, oats, rye, etc., are sometimes sown to prevent the soil being blown away. The method of culture is much the same as elsewhere.

At Concord the asparagus season opens usually about May 5th. The shoots are cut two or three inches under ground and should be about eight inches in length. These are laid in handfuls on the ground by the cutter, each one cutting two rows. The product of four rows is laid in one row, making what is called a "basket row." These "basket rows" are gathered in baskets, boxes, or wheelbarrows, and taken

to the packing-shed. The asparagus is placed on a table and packed in racks of uniform size, passed to the person who ties, and then to be butted off. The bunches are then washed and set up in troughs ready for market. Water is added in season to swell the bunch tight and it is then packed in bushel boxes for market, going in by teams each night.

Asparagus was free from pests until 1889, when the asparagus beetle made its unwelcome appearance. Methods of fighting the beetle were unknown to growers generally at that time, but necessity soon taught us. Chickens and hens are used with good results, also Paris green dry was applied with an air-gun when the dew was on the foliage. Cutworms sometimes do the asparagus crop severe damage, but chickens and hens are a sure remedy—in fact, hens are a decided benefit in an asparagus field, keeping down many weeds.

After learning to control the asparagus beetle we were visited by the rust, which has proved a stubborn foe and absorbs the sap which ought to go to the growing plant. Appearing in July, 1897, the rust seriously damaged many beds in eastern Massachusetts. Many remedies have been suggested, but so far none of them have proved perfectly satisfactory. Growers have been advised to cut the infected tops as soon as the rust appears, but such a practice is all wrong, however good in theory. Do not cut the tops until the sap has left the stalks. This is the advice of a large number of asparagus growers and scientific men who are engaged in experimental work.

CHARLES W. PRESCOTT.

Middlesex County, Mass.

ASPARAGUS ON LONG ISLAND

The cultivation of asparagus on Long Island does not differ materially, in most respects, from that practiced in other localities, other than in its extent. But there is probably more to be learned about its cultivation there than in any other section of the country, from the fact of its being grown under such changed conditions of soil. Here it can be shown that the character of soil is not, of itself, of great importance, and that on soil usually considered worthless—on land that can be bought, uncleared, at from five to ten dollars per acre—asparagus can be made as profitable a crop as on land considered cheap at one hundred dollars per acre.

Nearly every farm, the northern boundary of which is the Long Island Sound, has from two to twenty acres of soil composed very largely of fine drift sand, in all respects like quick-sand in character. This, when mixed with light loam, as is frequently the case, is the most favorable land for asparagus, and in such it is largely grown, being unsuited to potatoes or cereals, and where grasses make but a feeble struggle for existence. Within five minutes' walk to the south the soil is from a lively to a quite heavy loam, in which corn, potatoes, cabbage, cauliflower, and, in fact, all other crops revel. In this soil the asparagus also finds a congenial home, but no better than in the sand, in which but little else can be grown; neither can it be grown here more profitably. The expense for fertilizers is a little more on the sandy soil, but the cost in labor on the heavy soil will quite

equal the cost of extra fertilizer required on the light.

Whether away from a saline atmosphere a light soil would be as favorable as a heavy one for the asparagus is a question that practical experiment only can settle. But it is an important one, as it is not generally supposed that it is possible to grow asparagus, at a profit, on such soils as are now being devoted to this crop on Long Island.

That which has been called the barren wastes, the dwarf-pine and scrub-oak lands of Suffolk County, can be made most profitable farming lands may be a surprise to many, but that such is the case does not admit of a doubt. As evidence of this, let us state what is being done along these lines. Messrs. Hudson & Sons, leading canners of asparagus, have bought a farm of 525 acres of as poor land as it is possible to find on Long Island, which they are to devote exclusively to this crop. They have already more than fifty acres planted, and are getting the whole in readiness as rapidly as possible. This is no experiment, but simply doing on a large scale what has profitably been done on a small one.

On similar soils a low estimate of net profit is \$100 per acre, and there are many instances where double this profit is made. The price paid last season by the canners was \$14 per 100 bunches for first quality, and \$6 per 100 for culls, or "tips," as they are usually called. With good cultivation, which means a liberal supply of plant food—and there is no crop that requires more—and the surface kept clean, free from weeds, and frequently cultivated, so that the

surface is at all times loose and fine to prevent evaporation, the average yield is 2,500 bunches per acre. If we estimate the tips at 25 per cent. of the crop, the gross receipts will amount to \$200 per acre.

After a given acreage is ready for cutting, which is the third year after planting, the annual cost of cultivation is not very much, if any, more than that of a crop of potatoes. It is a question whether the actual cost of growing and marketing an acre of asparagus is not less than that of an acre of potatoes. Some growers assert it is three times as much work to take care of a given acreage of asparagus as of potatoes; admitting it, the relative cost is stated above.

C. L. ALLEN.

Nassau County, N. Y.

ASPARAGUS IN NEW JERSEY

An important point in asparagus culture is to remove the top growth in the fall of the year. For this purpose I use a mowing-machine, then rake up the brush and burn it on the bed. After this I top-dress heavy with manure, leaving it lie on the land until spring.

Just as soon as the ground is fit to work at all I put on a disk-harrow, and cut it about four times each way until it is thoroughly pulverized. Then with a smoothing-harrow I level it, and repeat the smoothing-harrow operation about once a week to keep down all weeds coming through. Then we let it go as long as we can, possibly two weeks, and at the appearance of weeds we take an ordinary sweet-potato ridger having a

plow on either side and run it astride the row, covering everything in the row. Doing this on Saturday afternoon holds the asparagus back over the following day. Then we take the middle out with a one-horse cultivator. This is done probably three times during the cutting season, which is eight weeks. With the help of one of these weeders, which we use at least once a week, we keep the bed quite clean of all weeds, and this I consider very essential. The cultivation should continue after cutting until the top growth becomes so large as to protect the ground, and then there will be but little trouble late in the season about weeds. It doesn't pay to grow them anywhere, and especially not in asparagus beds.

In planting, the ground should be well prepared and furrowed out eight inches in depth, four and one-half feet apart, and the plants two and one-half feet in the row, with a little fine manure in bottom of row; put about two inches of soil on the plants to cover. Then as the sprouts come up, keep on filling the furrows by cultivation.

I have been using some commercial manures the past two years, applying at the rate of one ton to the acre about the rows in the spring; then nearly a ton of salt to the acre applied at any time. It helps keep weeds down and gives the asparagus a good flavor. Above all, do not forget to apply the fertilizer, and Plenty, with a big "P," of it—either stable manure or commercial fertilizers. Probably there will be less weeds by using the latter, but there needs to be a great deal of the former in the beginning for several years, to give the bed a good body of rich earth, from which

the plants feed. It appears to me this is the secret of success.

Much depends upon how asparagus is put up for the market, making it look attractive, in nice, clean, new crates and neatly prepared bunches, and the stalks must be large, tender, and of good flavor. Grass from a strong bed grown in twenty-four hours is much more tender and better in every way than grass grown in forty-eight hours from a poor bed. We are compelled to cut every twenty-four hours, or the asparagus would waste, and the gathering is accomplished in about three and one-half hours each day, early in the morning.

JOEL BORTON.

Salem County, N. J.

ASPARAGUS IN THE SOUTH

There is no crop grown by the Southern trucker that has paid better than asparagus year after year. With many of the other truck crops sent North the growers have to contend with a host of planters who rush in at times to plant certain crops like early potatoes, peas, and beans, and whose inferior crops often glut the market and make the season unprofitable all around. These men drop out after a season that their particular venture did not pay, and the regular truckers, being well aware that they would do so, always redouble their efforts the year after a bad season with any particular crop, knowing from experience that then it would be certain to be profitable.

But the asparagus crop is one into which the tem-

porary growers can not jump in and out of, for the crop requires special preparation of the soil and patient waiting and culture pending the time for reaping a harvest, and the men who are always ready to jump into the annual crops always wish to realize at once, and do not generally have the capital to put into a crop that requires several years before realizing. Hence the asparagus crop has been left to the regular market gardeners, and has been uniformly profitable when well managed.

As regards soil for asparagus in the South, it should be deep, light, warm, and well drained, either naturally or artificially. The level sandy soils that abound in all the South Atlantic Coast region, having a compact subsoil of reddish clay under it at a moderate depth, makes the ideal soil for the early asparagus.

In preparing such a soil for the crop, it is well to be thorough in the matter, for the crop is to remain there indefinitely, and if success is to be expected the previous preparation should be of the most thorough character. Hence, as the soils best adapted to the growth of the plant are commonly deficient in vegetable matter, which desirable characteristic can only be found in abundance on the lands too low and moist for the asparagus crop, some preparatory culture should be used that will tend to increase the amount of organic decay in the soil.

For this purpose there is nothing better than the Southern field or cow pea. The land should be prepared by giving it a heavy dressing of acid phosphate and potash, and putting it in peas sown broadcast at the rate of a bushel or more per acre. With a heavy dressing

of the mineral fertilizers the pea crop will be heavy, and should be allowed to fully ripen and decay on the land, to be plowed under, and the process repeated the following year. In the mean time the seed should be sown for the growth of the roots for setting the land.

Two crops of cow-peas allowed to die on the land and turned under will give a store of vegetable matter that would be hard to get in any other manner. While heavy manuring with stable manures is very desirable where the material can be had at a reasonable cost, the larger part, and, in fact, nearly all of the Southern asparagus, must be grown by the aid of chemical fertilizers, and the storing up of humus in the land from the decaying peas is an important factor in the placing of the soil in a condition to render the chemical fertilizers of more use, since the moisture-retaining nature of the organic matter plays an important part in the solution of matters in the soil. Aside from this, there will be a large increase in the nitrogen contents of the soil through the nitrification of this organic matter.

The second crop of peas should be plowed under in late fall when perfectly ripe and dead, so that the land can be gotten into condition for planting in early spring. The land should be thoroughly plowed, and if the clay subsoil comes near the surface it should be loosened with the subsoil plow. Furrows are then run out four and a half to five feet apart, going twice in the furrow, and then cleaning out with shovels till there is a trench a foot deep. In the bottom of this trench place a good coat of black earth from the forest, or, if well-rotted manure can be had, use that of course.

Set the plants twenty inches apart in the furrow, and by means of hand-rakes pull in enough earth to barely cover the crowns.

As growth begins, the soil is to be gradually worked in around the advancing shoots till the soil is level. Now give a dressing of 1,000 pounds per acre, alongside the rows, of a mixture of 900 pounds of acid phosphate, 500 pounds of fish scrap, 200 pounds of nitrate of soda, and 400 pounds of muriate of potash, and keep the plants cultivated shallowly and flat with an ordinary cultivator till the tops are mature. An application of salt may be useful if applied in the fall in making some matters in the soil available, but salt in itself is of no use whatever to the plants. We would never apply salt in the spring, as it has a tendency to lessen nitrification and to retard the earliness of the shoots.

The annual dressing of the fertilizer named should now be increased to a ton per acre, and it should be applied not later than February 1st in each year. After the tops have been cut in the fall it is a good plan to plow furrows from each side over the rows and to plow out the middles, for the shoots will always start earlier in an elevated ridge, which warms up earlier in the spring.

The second year after planting cutting may begin, and the shoots must be cut as fast as they show, care being taken to cut down near the crown of the roots, but not to injure the other shoots that may be starting. After cutting is over—and the length of time the bed should be cut is of little importance in the South, for the price at the point where it is shipped will

always tell you when to stop—the soil should be again worked down flat, and if the growth has not been as satisfactory as could be wished, a dressing of 100 pounds per acre of nitrate of soda at this time will usually pay very well. Asparagus should always be bunched in a machine made for that purpose. The bunches are packed in crates just deep enough to hold the bunches set upright on a bed of moss, and a cover of the same damp moss should be placed on top.

Where there is a demand for green asparagus the planting should be done more shallowly in a simple furrow, and the entire culture should be flat and shallow. The shoots are cut at the surface of the ground after they have attained the proper length. One thing is to be observed in either method, and this is that during the cutting season everything long enough must be cut daily, and that the little shoots be not allowed to run up and branch out. Cull the shoots after they are all out and bunch accordingly. Green shoots should be bunched by themselves and not mixed with the blanched ones. None but new, light crates should be used, for a clean and neat package will always favor its contents in the selling.

W. F. MASSEY.

North Carolina Agricultural Experiment Station.

ASPARAGUS CULTURE IN CALIFORNIA

The growing of asparagus for market in California is proving to be one of the most successful of its minor industries. There is a large area in the State which is exactly suited to the production of this vegetable. This is the region of sedimentary

deposits, washed by waters that are to some extent brackish, or naturally saline. Commercial asparagus farming is limited to the reclaimed lands around the bay of San Francisco, the marshy deltas of the San Joaquin and Sacramento rivers, and the so-called peat lands of Orange and San Luis Obispo counties. Small beds, however, for local consumption are to be found in California as generally and frequently as they are in other States.

There is a fascination about asparagus culture that is founded on legitimate financial returns. It is practically "a sure thing" when once established, and the conditions of climate and soil are such that the work attendant on production is a minimum in proportion to the return. No diseases of the plant have yet shown themselves in California, and it is seldom that the weather is unsteady enough to be a factor in limiting production. The deterring feature is the fact that it is not till the third year that a return can be expected on the investment. But as other crops, such as potatoes and beans, can be grown between the rows in the interim, the time of waiting is not so entirely an unproductive one as might at first be supposed.

The methods of preparing, planting, and working are practically the same in all sections of California. The proposed beds are plowed as deeply as possible and thoroughly fertilized. All of the soils appropriate for commercial asparagus farming are so light that deep cultivation is a comparatively easy matter. Furrows for planting are then run and made double depth. Some growers think it worth while to distribute fer-

tilizer along these furrows and then turn for a third time, so as to enrich the ground immediately below the roots to be set out. These furrows are run from four to six feet apart, the latter being considered the better usage. In them one-year-old plants are then set by hand at distances varying from eighteen inches to three feet. The former distance is preferred by the Italian growers on Bay Farm Island in San Francisco Bay, but the Southern growers and those along the Sacramento River lean to the greater distance. The only difference seems to be whether there will be sufficient nutriment in the soil to force the plant into giving as large and tender shoots as where each plant is allowed a larger area. The plants are set with the crowns about four inches below the surface and the roots are carefully spread out before covering. Planting is done any time from November to April, but the middle of February is perhaps the most common time.

The culture for the first year consists in keeping the soil loose and free from weeds. Ordinarily other crops are grown between the rows, and their cultivation serves to keep the ground in proper condition. The asparagus is allowed to come up, feather, and seed without interference, no cutting being done the first year. Care, however, is taken to cut off the tops close to the ground in the fall before the seed begins to drop—the volunteer asparagus being the worst enemy in culture with which the grower has to deal. About the beginning of the rainy season a heavy coating of manure is placed over the beds and left to be leached in by the rains.

The second year some growers cut more or less for

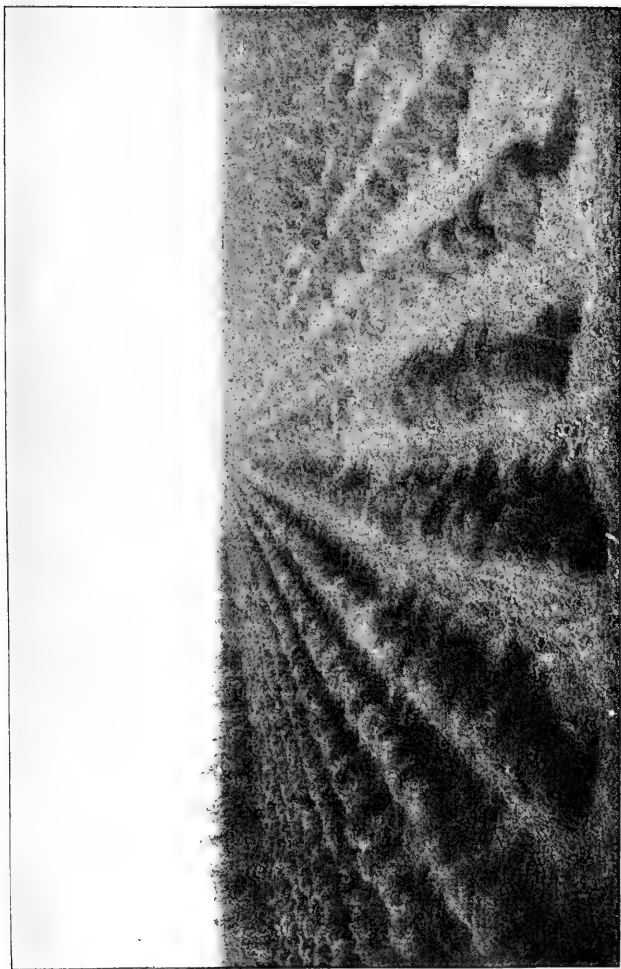


FIG. 48—VIEW OF ASPARAGUS FIELD ON BOULDIN ISLAND, CALIFORNIA

market, but the bed is then longer in coming to its full strength and will not give so large a product the following years. There is a variation in the spring working, according to the nature of the land. Where the soil has a tendency to be cold, the first plowing is away from the rows, so as to let the sun more quickly down to the starting plants. Where the soil is light, or the season forward, this plowing is omitted. The latter plowings are toward the rows, the effort being by ridging to give a long blanched surface to the shoots. For the canneries where nothing but the white product is put up, the shoots are cut the instant they show their tips above the surface. The local market shows a preference for the greener shoot, and so before cutting it is allowed to stretch itself up into the light. The third year regular cutting begins, and from that time forward the beds increase in the quantity and quality of the product for the next fifteen years.

The methods of marketing are somewhat different from those practiced in the East. Little or none of the asparagus is bunched. It is packed loose in boxes holding from forty to fifty pounds, and the loose product is retailed to the consumer by the pound. The first boxes begin to go out by the beginning of February, though small quantities can be seen in market as early as January 15th. The canning contracts run, as a rule, from March 1st to June 15th. After that the weather is so dry that the yield stops unless the beds are irrigated. In most sections, however, irrigation is not necessary up to this time.

A notable exception to this is Bouldin Island, in

the San Joaquin River. This is reclaimed land, and lies some six or eight feet below the surface of the water. The soil is river silt on a peat stratum thirty feet deep. The top is so fine and friable that it does not, in spite of the surrounding river, hold enough moisture to keep the vegetation alive during the hot spring months. A north wind in May would lift up the whole surface of the island and carry it away in dust. It is an easy matter, however, to let in water through the dikes, and this is done in sufficient quantities to keep the soil in place.

The question of profit in asparagus growing is one that can only be treated in a relative way. The industry is as yet so new, and instances of phenomenal returns from small holdings are so many, that it is hard to arrive at what might be called a commercial ratio of gain. It is safe to say, however, that with ordinary care there has never been an actual loss with asparagus culture in California. A low estimate of profit is probably \$50 per acre. The cost of preparation and planting where diking has not been necessary has seldom been more than \$100 per acre. The gross returns taken from recent years' reports vary from \$100 to \$200 per acre, so that it can readily be seen that the return to the asparagus farmer is very fair. Most of the farms in California are in rented land. The Bay Farm Island people pay a ground rent of \$50 per acre. On Bouldin Island the rental is on a basis of 40 per cent. of the net proceeds. In Fig. 48 is presented a view of a fully established asparagus field on Bouldin Island.

WARREN CHENEY.

Alameda County, Cal.

ASPARAGUS IN FRANCE

Asparagus is grown much more abundantly and to a much larger size in France than in England. The country is half covered with it in some places near Paris; farmers grow it abundantly, cottagers grow it, and everybody eats it. Near Paris it is chiefly grown for market in the valley of Montmorency and at Argenteuil, and it is cultivated extensively for market in many other places. About Argenteuil several thousand persons are employed in the culture of asparagus.

It is grown to a large extent among the grape-vines as well as alone. The vine under field culture is cut down to near the old stool every year, and allowed to make a few growths which are tied erect to a stake. One plant is put in each open spot, and given every chance of forming a large specimen, and this it generally does. The growing of asparagus among the vines is a very usual mode, and a vast space is thus covered with it about here.

It is also grown in other and special ways. Perhaps the simplest and most worthy of adoption is to grow it in shallow trenches. These are usually about four feet apart. The soil generally is a rather stiff sandy loam with calcareous matter in some parts, but the soil has not all to do with the peculiar excellence of the vegetable. It is the careful attention to the wants of the plant which produce such good results. Here, for instance, is a young plantation planted in March, and from the little ridges of soil between the trenches have just been dug a crop of small early potatoes. In England the asparagus would be left to

the free action of the breeze, but the French cultivators never leave a young plant of asparagus to the wind's mercy while they can find a stake of oak about a yard long.

When staking these young plants they do not insert the support close to the bottom, as we are too apt to do in other instances, but a little distance off, so as to avoid the possibility of injuring the root; each stake leans over its plant at an angle of forty-five degrees, and when the shoots are big enough to touch it, or to be caught by the wind, they are tied to the stake. The ground in which this system is pursued being entirely devoted to asparagus, the stools are placed very much closer together than they are among the vines—say, at a distance of about a yard apart. The little trenches are about a foot wide and eight inches deep.

The best asparagus in France is grown at Argenteuil and by one system mainly. The plants—one-year seedlings (never older)—are planted in shallow trenches seven or eight inches deep, the plants a little more than one yard apart and the lines four feet apart. No manure is given at planting; no trenching or any preparation of the ground, beyond digging the shallow trench, takes place. In subsequent years a little manure is given over the roots in autumn; the soil, thrown out of the trenches and forming a ridge between them, is planted with a light crop in spring. In all subsequent years the earth is placed over the crowns in spring and removed in autumn.

Under this system good results are obtained in various soils, the only difference being that on cold clay soils the planting is not quite so deep. Every

winter the growers notice the state of the young roots, and any spot in which one has perished they mark with a stick, to replace the plant the following March. Early every spring they pile up a little heap of fine earth over each crown. When the plantation arrives at its third year they increase the size of the mound, or, in other words, a heap of finely pulverized earth is placed over the stool, from which some, but not much, asparagus is cut the same year, taking care to leave the weak plants and those which have replaced others untouched for another year.

The process of gathering is interesting to the stranger. Asparagus knives of various forms are described in both French and English books, but one is confidently told by the growers that they are only fitted for amateurs who do not care to soil their fingers. The cultivators here never use a knife, the work being done with the hands. Gatherings are made every second day about the end of April, but in May when the growth is more active the stools are gathered from every day.

The French mode of cultivating asparagus differs from the English principally in giving each plant abundant room to develop into a large healthy specimen, in paying thoughtful attention to the plants at all times, and in planting in trenches instead of a raised bed. They do not, as is done in England, go to great expense in forming a mass of the richest soil far beneath the roots, but rather give it at the surface, and only when the roots have begun to grow strongly. —W. ROBINSON, in "Parks and Gardens of Paris."

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